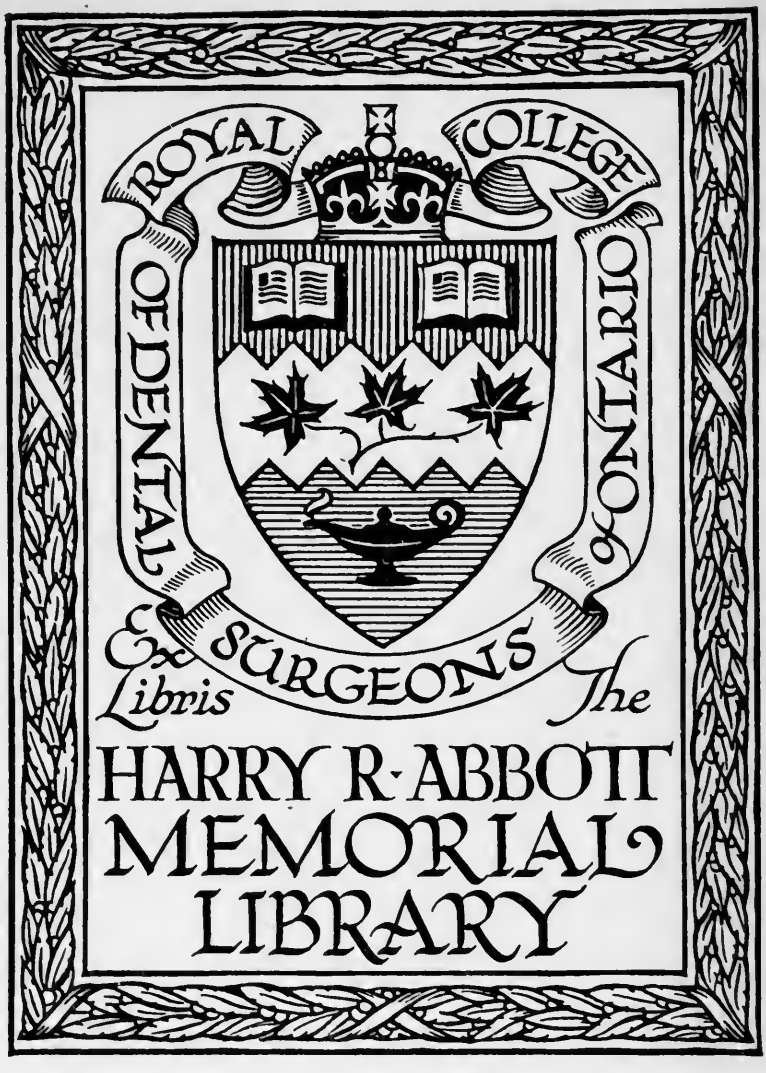
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1867 King, R. F. H., L.D.S.Eng. Appleton Gate, Newark.

1882 King, Thos. Edward, L.D.S.Eng. 17, Lendal, York.

1885 Kirby, A., L.D.S.Eng. 1, Harpur Place, Bedford.

1887 Kissack, Frank H., L.D.S.Eng. 17, Bentinck Street, Manchester Square.

1886 Kluht, Henry J., L.D.S.Glas. 44, Norfolk Terrace, Westbourne Grove, W.

1860 Kölliker, Paul Alfred. 10, Obere Zaune, Zurich, Switzerland. (*Corresponding.*)

1886 Kutz, Albert, J., L.D.S.Irel. 32, Wimpole Street, Cavendish Square.

1885 Lechmere, E., L.D.S.Eng. 14, Stratford Place, W.

1877 Levason, Arthur G., L.D.S.Irel. 12, Bridge Street, Hereford.

1886 Levason, Peyton Grenville, L.D.S.Eng. 12, Bridge Street, Hereford.

Elected.

1867 Longhurst, Henry Bell, L.D.S.Eng. 28, Old Burlington Street. (C. 1877-78-79.)

1888 Lovitt, Robert, L.D.S.Eng. 219, Albany Street, Gloucester Gate, N.W.

1883 Lucas, George J., L.D.S.Edin. Linden Lodge, Gravesend, Northfleet.

1869 McAdam, George C., L.D.S.Eng. King Street, Hereford. (C. 1884-85, V.P. 1887-88-89.)

1884 McCall, John H., L.D.S.Eng. The Spa, 13, Belvoir Street, Leicester.

1876 Macgregor, Malcolm, L.D.S.Edin. 20, Queen Street, Edinburgh.

1876 Macleod, William B., F.R.S.Edin., L.D.S.Edin. 16, George Square, Edinburgh. (C. 1888, V.P. 1889-90.)

1880 Maggs, W. A., L.R.C.P.Lond., M.R.C.S.Eng., L.S.A., L.D.S.Eng. 16, Hanover Square, W. (H.F.S. 1890.)

1878 Magitot, E., 8, Rue des St. Pères, Paris. (*Corresponding.*)

1860 Magor, Martin, L.D.S.Eng. 24, Chapel Street, Penzance. (C. 1882.)

1876 Mallet, Gilbert. Old Rectory, Newbury.

1882 Mansell, Thos., L.D.S.Edin. 29, Hamilton Square, Birkenhead.

1881 Margetson, W. E., M.R.C.S.Eng., L.D.S.Eng. Roscoe House, Leeds Road, Dewsbury.

1886 Markham, R. L., L.D.S.Irel. 9, Eldon Square, Newcastle-on-Tyne.

1862 Martin, J. H. C., M.D.Edin., M.R.C.S.Eng., L.D.S.Eng. Cambridge House, Portsmouth. (C. 1871-73.)

1875 Martini, Luigi, M.D. 7, Viol Poad, Turin, Italy.

1882 Mason, Charles Browne, L.D.S.Eng. 2, West Park Terrace, Scarborough.

1877 Mason, Henry B., L.D.S.Eng. 3, Bedford Circus, Exeter. (C. 1890.)

1880 Matheson, Leonard, L.D.S.Eng. 70A, Grosvenor Street, W. (C. 1889-90.)

Elected.

1876 MATTHEW, CHARLES, L.D.S.Edin. 15, Ainslie Place, Edinburgh.

1883 MATHEWS, A. ALEXANDER, L.D.S.Eng. 12, North Parade, Bradford.

1888 MATTHEWS, WM., L.D.S. 60, Rodney Street, Liverpool.

1879 MAY, PERCY, M.R.C.S.Eng., L.D.S.Edin. 15, Endsleigh Gardens, N.W.

1865 MEDWIN, AARON GEORGE, M.D.St. And., L.R.C.P.Lond., M.R.C.S.Eng., L.S.A., L.D.S.Eng. 34, Bruton Street, Berkeley Square, W. (C. 1873-74-75.)

1877 MERSON, FRANK. 36, East Street, South Molton.

1878 MERSON, JAMES, L.D.S.Eng. 28, Harley Street, W.

1874 MERSON, WILLIAM, L.D.S.Eng. Lainston Lodge, Bournemouth.

1888 MILLER, Prof. W. D. University, Berlin. (*Corresponding.*)

1868 MITCHELL, F. W., L.D.S.Eng. 176, Clapham Road, S.W.

1888 MITCHELL, WM., D.D.S.Mich. 15, Upper Brook Street, Grosvenor Square, W.

1874 MOORE, EDWARD. 2, Stanley Villas, St. James's Road West, Croydon.

1857 MORLEY, HENRY, L.D.S.Eng. 87, London Road, Derby. (C. 1869-70.)

1874 MUMMERY, JOHN HOWARD, M.R.C.S.Eng., L.D.S.Eng. 10, Cavendish Place, Cavendish Square. (H.F.S. 1881-82, H.S. 1883-84, C. 1885-86, V.P. 1887-88-89.)

1884 MUNDELL, STEPHEN, L.D.S.Eng. 19, Bedford Circus, Exeter.

1884 MURIE, J., M.D.Glas., LL.D. St. Andrew, Burlington House. (*Honorary.*)

1876 MURPHY, JAMES EDWARD, L.D.S.Eng. 2, St. James's Street, Derby.

1889 NEALE, W. H. BREWARD, L.D.S.Irel. 7, Newhall Street, Birmingham.

1882 NEWLAND-PEDLEY, F., F.R.C.S.Eng., L.D.S.Eng. 32, Devonshire Place, Portland Place, W. (C. 1890.)

Elected.

1883 Newton, Fredk. Harris, L.D.S.Eng. 80, Brook Street, Grosvenor Square.

1879 Noble, Chas. J., L.D.S.Eng. 96, Cornwall Gardens, S.W.

1874 Northrop, A. L., M.D., D.D.S. 57, West Forty-ninth Street, New York City.

1859 O'Meara, Alfred. Kennedy Lodge, Simla, India. (V.P. 1879-80-81.)

1859 Orphoot, Peter, M.D.Edin. Univ. 113, George Street, Edinburgh. (V.P. 1869-70-73-74.)

1861 Owen, Sir Richard, K.C.B., F.R.S. Sheen Lodge, East Sheen, S.W. (*Honorary*).

1876 Paget, Sir James, Bart., F.R.S., D.C.L., LL.D., F.R.C.S. Eng. 1, Harewood Place, Hanover Square, W. (*Honorary.*)

1884 Pallant, Arthur, L.D.S.Irel. Orchard House, Maidenhead.

1864 Palmer, Gascoigne, T. W., L.D.S.Eng. 1, Royal Crescent, Cheltenham. (C. 1879-80-81.)

1859 Palmer, James Edwin. Priestgate, Peterboro'. (C. 1881-82.)

1879 Parkinson, Geo. W., M.R.C.S.Eng., L.D.S.Eng. 36, Sackville Street, W.

1885 Parkinson, Herbert S., L.D.S.Eng. 36, Sackville Street, W.

1856 Parkinson, James, L.D.S.Eng. 36, Sackville Street. (C. 1856-57-58-59-63-72, V.P. 1865-67, P. 1868, T. 1873-74-75-76-77-78-79-80-81-82-83-84-85-86.)

1860 Parks, William J., L.D.S.Eng. 27, Newington Crescent, Kennington Park Road.

1874 Parson, Thomas Cooke, M.R.C.S.Eng., L.D.S.Irel. Atherstone House, 21, White Ladies' Road, Clifton, Bristol. (C. 1889-90.)

1883 Paterson, Hugh, Dental Surgeon. Sydney, N.S.W.

1887 Paterson, W. Bramfield, F.R.C.S., and L.D.S.Eng. 64, Brook Street, Grosvenor Square.

Elected.

1877 Payne, Arthur G. Netley, Old Christchurch Road, Bournemouth.

1876 Payne, George, L.D.S.Eng. 34, Ebury Street, Pimlico.

1880 Pedley, George, 17 and 18, Railway Approach, London Bridge.

1889 Pedley, R. Denison, 17, Railway Approach, London Bridge.

1885 Penfold, W., L.D.S.Irel. 30, York Street, Portman Square, W.

1864 Petty, F., L.D.S.Eng. 10, Forbury, Reading. (C. 1875-76-77.)

1880 Pike, J. L. F., L.D.S.Eng. 273, Glossop Road, Sheffield.

1868 Pitowsky, Arnold. Fairleigh, Westbourne, Bournemouth.

1871 Platt, Leon J., L.D.S.Edin. 64, Murray Place, Stirling.

1882 Poinsot, P. H. V. 10, Rue Chanchat, Paris.

1863 Porter, W. P. 44, Finsbury Pavement, E.C.

1882 Power, Thos. Henry, L.D.S.Irel. Walton-on-Thames.

1859 Pratt, R. J. H. 2, Suffolk Place, Pall Mall, S.W.

1883 Price, Rees, L.D.S.Eng. 163, Bath Street, Glasgow.

1883 Quinby, Henry Clay, L.D.S.Irel. 21, Rodney Street, Liverpool.

1883 Quinby, Melville G. C. 21, Rodney Street, Liverpool.

1859 Randell, E. B., M.R.C.S.Eng., L.D.S.Eng., 22, Vanbrugh Park, Blackheath, S.E. (C. 1878-79.)

1889 Read, Henry G., L.D.S.Eng., M.R.C.S.Eng., L.S.A., L.R.C.P.Lond. 30, Finsbury Square, E.C.

1880 Read, Laurence, L.D.S.Eng. 18, Hanover Street, Regent Street, W.

1882 Read, Thomas, L.D.S.Eng. 31, Cavendish Square.

1889 Read, Thos. St. George, L.D.S.Eng., D.M.D.Harv., 31, Cavendish Square, W.

Elected.

1876 Reading, Edward. Elizabeth Street, Hyde Park, Sydney, N.S.W.

1888 Reading, Richard Fairfax, M.R.C.S.Eng., L.R.C.P. Lond., L.D.S.Eng. Elizabeth Street, Hyde Park, Sydney, N.S.W.

1866 Reboul, A. P., L.D.S.Eng. 60, Liverpool Road, Islington. (C. 1878-79.)

1871 Redman, J. H., D.D.S.Phil., L.D.S.Irel. 61, Old Steine, Brighton. (C. 1887-88-89, V.P. 1890.)

1870 Reid, Robert, L.D.S.Eng. 19, Heriot Row, Edinburgh. (C. 1885-86.)

1889 Rhodes, W. A., L.D.S.I. 53, Trumpington Street, Cambridge.

1889 Richards, George Oliver, M.R.C.S.Eng., L.D.S.Eng. Onslow House, 9, The Green, Richmond, Surrey.

1863 Richardson, B. W., M.D.Lond., F.R.S., &c. 25, Manchester Square, W. (*Honorary.*)

1882 Robbins, Cornelius, L.D.S.Eng. 32, Oxford Road, Kilburn.

1886 Roberts, Chas. Alfred, L.D.S.Eng. 47, Weymouth Street, Portland Place.

1878 Robertson, Andrew. 25, Castle Street, Hereford.

1876 Robinson, George, Eden Street, Oamaru, New Zealand.

1877 Rogers, Claude, M.R.C.S.Eng., L.D.S.Eng., D.M.D. Harvard. 142, Harley Street, W. (H.F.S. 1883.)

1856 Rogers, Henry, M.R.C.S.Eng., L.D.S.Eng. 16, Dorset Square. (C. 1872-73.)

1863 Rogers, R., L.D.S.Irel. Alma House, Rodney Place, Cheltenham. (C. 1883-84, V.P. 1886-87-88.)

1856 Rogers, Thomas Arnold, M.R.C.S.Eng., L.D.S.Eng. 23, Endsleigh Street, Tavistock Square. (H.S. 1856-59, H.F.S. 1860-61, V.P. 1862-64-79-80, P. 1865-81, C. 1869-71-83-84, L. 1872-73-74-75-76-77-78, T. 1887-88-89-90.)

1882 Rose, Harry, L.D.S.Eng. 59, Queen Anne Street, W.

1863 Rose, J. E. 64, Mount Pleasant, Liverpool. (C. 1875 V.P. 1880-81-82.)

Elected.

1888 Royston, Jonathan, L.D.S.Eng. 60, Rodney Street, Liverpool.

1888 Rymer, J. F., M.R.C.S., L.D.S.Eng. 1, Ashford Road, Maidstone.

1863 Rymer, S. L., L.D.S.Eng. 4, Wellesley Villas, Croydon. (C. 1863-68, V.P. 1869-70-81, P. 1882.)

1878 Sanders, J. J. H., L.D.S.Irel. The Square, Barnstaple.

1856 Saunders, Sir Edwin, F.R.C.S.Eng. 13a, George Street, Hanover Square, W. (T. 1856-60, V.P. 1861-63, P. 1864-79, C. 1868-69-74-75-80-81-87-88.)

1878 Saunders, Walter, D.D.S.Phil., L.D.S.Irel. Memel House, Ramsgate.

1876 Savory, William S., F.R.S., F.R.C.S.Eng. 66, Brook Street. (*Honorary.*)

1866 Sewill, Henry E., M.R.C.S.Eng., L.D.S.Eng. 40, Wimpole Street, W. (H.S. 1874-75-76, C. 1877-78-79, V.P. 1885-86-87, P. 1889.)

1888 Shillcock, Jos. W., L.D.S.Irel. 1, Rue Basse, Cannes, France.

1877 Simmons, James J., L.D.S.Eng. 18, Burton Crescent, W.C.

1864 Smale, H. C., L.D.S.Eng. 118, Oxford Street, Manchester.

1880 Smale, Morton A., M.R.C.S.Eng., L.S.A. L.D.S.Eng. 89, Seymour Street, Hyde Park, W. (C. 1885-86-87.)

1883 Smith, Alfred, L.D.S.Eng. 52, Parkhurst Road, Holloway, N.

1858 Smith, George W., M.R.C.S.Eng., L.D.S.Eng. 6, Aytoun Street, Manchester. (C. 1874-75.)

1863 Smith, J. A., L.D.S.Eng. 47, Smith Street, King's Road, Chelsea.

1883 Smithard, Walter, L.D.S.Irel. 15, Stretford Road, Manchester.

1889 Spokes, Sidney, M.R.C.S., L.D.S.Ed. 59, Queen Anne Street, W.

Elected.

1884 Stack, Richard Theo., M.D.Dub., F.R.C.S.Irel., L.R.C.S. Edin., D.M.D.Harvard. 10, Westland Row, Dublin. (C. 1889-90.)

1873 Stellwagen, Thos. C., M.D., D.D.S., Chestnut Street, Philadelphia. (*Corresponding.*)

1882 Sternfield, Alfred D., M.D. 3, Karlstrasse, Munich.

1888 Stevens, Alfred, L.D.S.Edin. and Irel. No. 1, The Terrace, Park Road, Clapham, S.W.

1873 Stevens, Mordaunt, M.R.C.S.Eng., L.D.S.Eng., D.D.S. Phil. 42, Rue Cambon, Paris. (C. 1890.)

1874 Stocken, James, L.D.S.Eng. 21, Endsleigh Gardens, N.W. (C. 1881-82-83, V.P. 1890.)

1886 Storey, J. Charles, L.D.S.Irel. Dunallan House, 9, Regent's Terrace, Anlaby Road, Hull.

1871 Stringfield, William, L.D.S.Irel. 30, London Road, Lowestoft.

1887 Sutton, John Bland, F.R.C.S.Eng. 48, Queen Anne Street, Cavendish Square. (*Honorary.*)

1877 Swanson, A. J., L.D.S.Eng. 112, Cheapside.

1881 Thomson, W. Scott, M.R.C.S.Eng., L.D.S.Eng. 19, Cavendish Place, Cavendish Square, W. (C. 1889-90.)

1871 Tippett, J. Collins. 14, Belgrave Terrace, Torquay.

1879 Tod, Ewen M., L.D.S.Eng. 9, Old Steine, Brighton.

1870 Tomes, Charles S., F.R.S., M.A.Oxon., M.R.C.S.Eng., L.D.S.Eng. 37, Cavendish Square, W. (Curator, 1870-71-72-73-74-75-76-77-78-79-80, V.P. 1881-82-83, C. 1884-85-89-90, P. 1887.)

1856 Tomes, Sir John, F.R.S., F.R.C.S.Eng., L.D.S.Eng. Upwood Gorse, Caterham Valley, Surrey. (H.S. 1856-58, V.P. 1859-61, P. 1862-75, C. 1864-66-67-70-72.)

1886 Tracy, Humph. W., L.D.S.Edin. 6, Hatter Street, Bury St. Edmunds.

1881 Truman, Chas. E., M.A.Camb., M.R.C.S.Eng., L.D.S. Eng. 11, Southwick Street, Hyde Park.

1860 Tubbs, C. F. 4, Athenæum Terrace, Plymouth.

Elected.

1867 Turner, J. S., M.R.C.S.Eng., L.D.S.Eng. 12, George Street, Hanover Square, W. (C. 1873-74-83, H.S. 1875-76-77-78, C. 1878-79-80-87-88, V.P. 1881-82, P. 1884.)

1879 Underwood, Arthur S., M.R.C.S.Eng., L.D.S.Eng. 11, Bedford Square. (C. 1885-86.)

1856 Underwood, Thomas, L.D.S.Eng. 11, Bedford Square. (C. 1860-61-62, H.F.S. 1864-65-66, V.P. 1871, P. 1872, C. 1878-79-80.)

1869 Van der Pant, F. J., L.D.S.Irel. Elm Lawn, Kingston-on-Thames. (C. 1889-90.)

1856 Vasey, Charles, L.F.P.S.Glas., L.D.S.Eng. 112, Cambridge Gardens, North Kensington. (C. 1862, H.S. 1863-65, C. 1867-69-75, L. 1872, V.P. 1873-74, P. 1876.) (*Honorary.*)

1860 Walker, Joseph, M.D. St. And., M.R.C.S.Eng. L.D.S. Eng. 22, Grosvenor Street, W. (C. 1868-71-79-82, V.P. 1880-81. P. 1883, Ed. Trans.)

1874 Wallis, C. J. Boyd, L.D.S.Eng. 23, Brook Street, Grosvenor Square, W. (C. 1886, H.F.S. 1887, H.S. 1888-89, C. 1890.)

1868 Wallis, George, L.D.S.Eng. 5, Wimpole Street, Cavendish Square, W. (C. 1880-81.)

1876 Washbourn, E. Norman, L.D.S.Eng. 17, Fountains Terrace, Ripon.

1888 Watson, George W., L.D.S.Edin. 3, Walker Street, Edinburgh.

1876 Wedl, Karl, Prof. Vienna. (*Honorary*).

1863 Weiss, Felix, L.D.S.Eng. 7, Montague Place, Russell Square. (C. 1865-77-78, L. 1879-80-81-82-83-84-85-86-87-88, V.P. 1889, P. 1890.)

1881 Weiss, F. Henri, L.D.S.Eng. 7, Montague Place, Russell Square.

1881 Weiss, Willoughby, L.D.S.Eng. 7, Montague Place, Russell Square. (H.F.S. 1886, H.S. 1887-88, C. 1889-90.)

Elected.

1874 Wells, John, L.D.S.Irel. Ringmoor Villa, Plymouth.

1863 West, C., L.D.S.Eng. 19, Finsbury Square, E.C. (C. 1876-77.)

1878 West, William, L.D.S.Irel. Cyprus Villa, Lewin Road, Streatham Common, S.E.

1876 Whatford, J. Henry, L.D.S.Eng. Elms Lea, 6, Seaside Road, Eastbourne. (C. 1885-86-87.)

1888 White, Edward A., M.D., M.C., L.D.S.Eng. 1, Highbury Place, N.

1876 White, R. Wentworth, M.R.C.S.Eng., L.D.S.Eng. 26, St. Giles's Street, Norwich. (C. 1888-89.)

1870 White, T. Charters, M.R.C.S.Eng., L.D.S.Eng. 26, Belgrave Road. (C. 1874-75-80-81-82, V.P. 1884-85, P. 1886.)

1882 Williams, E. Lloyd, L.R.C.P.Lond., M.R.C.S.Eng., L.S.A., L.D.S.Eng. 2, James Street, Buckingham Gate.

1888 Williams, Hugh Lloyd, M.R.C.S.Eng., L.D.S.Eng. 45, Devonshire Street, Portland Place.

1881 Williamson, W. H., M.D.Aber., D.D.S.Phil., L.D.S.Edin. 15, Union Terrace, Aberdeen.

1874 Wilson, Andrew, L.D.S.Edin. 2, North Charlotte Street, Edinburgh. (C. 1883-84, V.P. 1885-86-87.)

1864 Wilson, G., L.D.S.Irel. 4, Whitefriar Gate, Hull

1876 Winterbottom, Augustus, F.R.C.S.Eng., L.D.S.Eng. (C. 1884-85-86.) 16, Sloane Street, S.W.

1889 Winterbottom, Charles, M.R.C.S.Eng., L.D.S.Eng. 16, Sloane Street, S.W.

1875 Wood, Maurice D., L.D.S.Irel, Whitehall Place, Stockton-on-Tees.

1863 Wood, W. R., L.D.S.Eng. Carlisle House, Pavilion Buildings, Brighton. (C. 1878-79-80.)

1878 Woodburn, James C., M.D.Glas., L.F.P.S.Glas. 197, Bath Street, Glasgow.

1863 Woodburn, W. S., L.D.S.Glas. 17, Carlton Place, Glasgow.

Elected.

1886 Woodhouse, A. Clayton, M.R.C.S.Eng., L.D.S.Eng. 1, Hanover Square, W.

1856 Woodhouse, Alfred J., L.D.S.Eng. 1, Hanover Square, W. (C. 1867-79, V.P. 1877-78-79, P. 1880.)

1876 Woodhouse, Robert H., M.R.C.S.Eng., L.S.A., L.D.S. Eng. 1, Hanover Square, W. (H.F.S. 1884, H.S. 1885-86-87, C. 1888-89-90.)

1866 Woodhouse, William H., L.D.S.Irel. 1, Hanover Square, W. (C. 1880-81.)

1879 Woodruff, William Herbert, L.D.S.Eng. 13, New Burlington Street, W. (C. 1889-90.)

1878 Woods, W. T. Chowringhee, Calcutta, India.

1875 Wormald, T., L.D.S.Irel. 188, Union Street, Oldham.

1870 Worsley, John. 63, Fishergate, Preston.

1883 Yates, Sidney Greatrex. Berkley House, Ross (Hereford).

1863 Zinkgraf, F., L.D.S.Eng. 30, Romerstrasse, Durkheim an der Haardt, Rhine, Bavaria, Germany.

List of Members

Arranged under the Heads of the Cities, Towns, &c., in which they reside.

Aberdeen.

De Lessert, A. A.
Williamson, W. H.

America.

Bogue, Edward A. (New York City).
Cook, C. D. (Brooklyn).
Ives, C. F. (New York City).
Northrop, A. L. (New York).
Stellwagen, Thos. C. (Philadelphia).

Australia.

Belisario, John (Sydney).
Crank, Peter.
Jordan, Henry (Queensland).
Paterson, Hugh (Sydney).
Reading, Richard Fairfax (Sydney).

Barnstaple.

Sanders, J. J. H.

Bavaria.

Zinkgraf, F. (Burkheim au der Haardt Rhine).

Bedford.

Kirby, A.

Berlin.

Miller, Prof. W. D.

Belfast.

Andrew, John James.

Birkenhead.

Mansell, Thos.

Birmingham.

English, T. R. M.
Huxley, F. Earle.
Neale, W. Breward.

Bournemouth.

Hogue, Wilson.
Merson, William.
Payne, Arthur G.
Pitowsky, Arnold.

Bradford.

Mathews, A. Alexander.

Brighton.

Dennant, J.
Gibbons, S. Clifford.
Harrison, Walter.
Redman, J. H.
Tod, Ewen M.
Wood, W. R.

Bristol.

Ackland, William R.
Hayman, C. A.

Bury St. Edmunds.

Tracy, Humphrey W.

Cambridge.

Cunningham, George.
Rhodes, W. A.

Canada.

Beers, W. G. (Quebec).

Canterbury.

Bell, Martin Luther.

Carlisle.

Hele, Warwick.

Cheltenham.

Fernald, H. P.
Palmer, Gascoigne T. W.
Rogers, R.

Clifton, Bristol.

Parson, Thomas Cooke.

Cosham, Hants.

Baker, Alf. John.

Croydon.

Carpenter, Alfred.
Coles, James Oakley.
Hughes, Morgan.
Moore, Edward.
Rymer, S. L.

Darlington.

Fothergill, A.
Fothergill, J. A.
Fothergill, W.

Derby.

Morley, Henry.
Murphy, James Edward.

Dewsbury.

Margetson, W. E.

Dublin.

Baker, John A.
Bloom, Mark J.
Corbett, Daniel.
Corbett, Daniel, Jun.
Stack, Richard Theo.

Dundee.

Campbell, Walter.

Eastbourne.

Foran, J. C.
Whatford, J. Henry.

Edinburgh.

Hepburn, David.
Macgregor, Malcolm.
Macleod, William B.
Matthew, Charles.
Orphoot, Peter.
Reid, Robert.
Watson, George W.
Wilson, Andrew.

Epsom.

Keeling, G. R.
Keeling, G. R., Jun.

Exeter.

Ackland, J. McKno-.
Browne-Mason, J. T.
Mason, Henry B.
Mundell, Stephen.

Florence.

Dunn, Charles W.

Folkestone.

Henry, Martin.

France.

Darin, C. (Meudon).
Evans, Thomas Wm. (Paris).
Imrie, William (Paris).
Magitot, E. (Paris).
Poinsot, P. H. V. (Paris).
Shillcock, Jos. W. (Cannes).
Stevens, Mordaunt (Paris).

Glasgow.

Agnew, Joseph.
Brownlie, J. R.

FERGUS, OSWALD.
PRICE, REES.
WOODBURN, JAMES C.
WOODBURN, W. S.

Guernsey.

HUGO, GEORGE JOSEPH.
HUGO, SAMUEL GEORGE JOSEPH.

Hanley.

BAINES, A.

Hastings.

HENRY, GEORGE.

Hereford.

LEVASON, ARTHUR G.
LEVASON, PEYTON GRENVILLE.
MCADAM, GEORGE C.
ROBERTSON, ANDREW.

Hull.

STOREY, J. CHARLES.
WILSON, G.

Hungary.

ARKOVY, Dr. T. (Budapest).

India.

CLERK, SMOLLETT W. (Madras).
GOULD, HORACE J. (Madras).
O'MEARA, ALFRED (Simla).
WOODS, W. T. (Calcutta).

Inverness.

GRANT, W.

Ipswich.

COLE, J. F.

Ireland.

ENNISKILLEN, Earl of (Fermanagh.)

Isle of Man.

KARRAN, J. (Douglas.)

Isle of Wight.

ALABONE, ALFRED (Newport).

Italy.

ATKINSON, S. (Naples).
MARTINI, LUIGI (Turin).

Jersey.

BALCOMB, THOS.

Kingston-on-Thames.

JAMES, W. E.
VAN DER PANT, F. J.

Leeds.

BRUNTON, GEORGE.
CARTER, T. S.

Leicester.

MCCALL, JOHN H.

Liverpool.

MATTHEWS, WM.
QUINBY, HENRY CLAY.
QUINBY, MELVILLE G. C.
ROSE, J. E.
ROYSTON, JONATHAN.

London.

ACKERY, JOHN.
APPERLY, HERBERT.
BAILEY, G. H.
BALDWIN, HARRY.
BARNARD, ALFRED.
BARRETT, ASHLEY WILLIAM.
BARRETT, HENRY JOHN.
BARTLETT, EDWARD.
BAYFIELD, C. M.
BEALE, LIONEL S.
BENNETT, FRED. JOS.
BENNETT, STORER.
BETTS, ED. G.
BIRD, TOM.
BONNELL, BENTLEY J.
BRAINE, F. WOODHOUSE.
BRIDGMAN, F. G.
BROWNING, DANIEL.
BUXTON, DUDLEY W.

Canton, Frederick.
Canton, Fred Arthur.
Carteighe, John, Jun.
Cartwright, Alexander.
Cartwright, Samuel.
Coffin, Walter
Cook, Stanley.
Corbett, J. F.
Cormack, D.
Cotterell, Chas. Vincent.
Cronin, Augustus.
Curnock, George Dennis.
Davis, Charles D.
Davis, Henry.
Davis, Marcus John.
Davis, Murray.
Dewes, Hugh William.
Dowsett, George Harris.
Elliott, W. St. George.
England, W. J.
Ewbank, Francis.
Fairbank, John.
Faulkner, John.
Field, W. George.
Finzi, S. L.
Fletcher, John B.
Flower, W. H.
Forsyth, W. F.
Fripp, Trude.
Gartley, John A.
Gibbings, Ashley.
Gregson, G.
Halliday, Middleton W.
Harding, Milward.
Harding, T. Henry G.
Harris, A. Carpenter.
Harrison, Richard.
Henry, W. F.
Hepburn, David.
Hepburn, Robert.
Hern, William.
Hockley, George.
Hooper, G.
Hugo, Maurice.
Humby, W. R.
Hutchinson, S. J.
Huxley, T. H.
Ibbetson, George A.
Kendal, W. H.
Kissack, Frank H.
Kluht, Henry J.
Kutz, Albert J.
Lechmere, F.
Longhurst, Henry Bell.
Lovitt, Robert.
Maggs, W. A.
Matheson, Leonard.
May, Percy.
Medwin, Aaron George.
Merson, James.
Mitchell, F. W.
Mitchell, Wm.
Mummery, John Howard.
Murie, J.
Newland-Pedley, F.
Newton, Fredk. Harris.
Noble, Chas. J.
Owen, Sir Richard.
Paget, Sir James.
Parkinson, Geo. W.
Parkinson, Herbert S.
Parkinson, James.
Parks, William J.
Paterson, W. Bramfield.
Payne, George.
Pedley, George.
Pedley, R. Denison.
Penfold, W.
Porter, W. P.
Pratt, R. J. H.
Randell, E. B.
Read, Henry G.
Read, Laurence.
Read, Thomas.
Read, Thomas St. George.
Reboul, A. P.
Richardson, B. W.
Robbins, Cornelius.
Roberts, Charles Alfred.
Rogers, Claude.
Rogers, Henry.
Rogers, Thomas Arnold.
Rose, Harry.
Saunders, Sir Edwin.
Savory, William S.
Sewill, Henry E.

Simmons, James J.
Smale, Morton A.
Smith, Alfred.
Smith, J. A.
Spokes, Sidney.
Stevens, Alfred.
Stocken, James.
Sutton, John Bland.
Swanson, A. J.
Thomson, W. Scott.
Tomes, Charles S.
Tomes, Sir John.
Truman, Charles E.
Turner, J. S.
Underwood, Arthur S.
Underwood, Thomas.
Vasey, Charles.
Walker, Joseph.
Wallis, C. J. Boyd.
Wallis, George.
Weiss, Felix.
Weiss, F. Henri.
Weiss, Willoughby.
West, C.
West, William.
White, Edward A.
White, T. Charters.
Williams, E. Lloyd.
Williams, Hugh Lloyd.
Winterbottom, Augustus.
Winterbottom, Charles.
Woodhouse, A. Clayton.
Woodhouse, Alfred J.
Woodhouse, Robert H.
Woodhouse, William H.
Woodruff, William Herbert.

Lowestoft.

Stringfield, William.

Macclesfield.

Bates, W.

Maidenhead.

Ghrimes, S.
Pallant, Arthur.

Maidstone.

Rymer, J. F.

Manchester.

Campion, Geo. W. G.
Campion, H.
Farnsworth, Charles.
Kelly, Thomas M.
Smale, H. C.
Smith, George W.
Smithard, Walter.

Middlesboro'.

Binns, Edmund.

Munich.

Sternfield, Alfred D.

Newark.

King, R. F. H.

Newbury.

Mallet, Gilbert.

Newcastle-on-Tyne.

Fothergill, Edward.
Markham, R. L.

New Zealand.

Coleman, Alfred (Nelson).
Cox, Edwin (Auckland).
Robinson, George (Oamaru).

Northfleet.

Lucas, George.

Norwich.

Bridgman, J. B.
White, R. Wentworth.

Nottingham.

Bellaby, G. W.

Oldham.

Wormald, T.

Oxford.

Bevers, Edm. Aug.
Bevers, Harcourt.

Penzance.

Magor, Martin.

Peterboro'.

Palmer, James Edwin.

Plymouth.

Balkwill, F. H.
Jewers, Ernest E.
Tubbs, C. F.
Wells, John.

Portsmouth.

Martin, J. H. C.

Preston.

Worsley, John.

Ramsgate.

Saunders, Walter.

Reading.

Petty, F.

Richmond (Surrey).

Richards, George Oliver.

Ripon.

Washbourn, E. Norman.

Ross (Hereford).

Yates, Sidney Greatrex.

Salisbury.

Farebrother, H. Lloyd.

Scarborough.

Grayston, William Cass.
Mason, Charles Browne.

Sheffield.

Harrison, Jos.
Pike, J. L. F.

Shrewsbury.

Harding, William E.

Southampton.

Bromley, C. H.

Southsea.

Cornelius-Wheeler, J.

South Molton.

Merson, Frank.

St. Leonards.

Amoore, D. W.
Dickinson, M. de C.

Stirling.

Platt, Leon J.

Stockton-on-Tees.

Wood, Maurice D.

Stroud.

Apperley, Ebenezer.

Switzerland.

Kolliker, Paul Alfred (Zurich).

Taunton.

Kendrick, Alfred.

Tavistock.

Brown, Richard.

Torquay.

Briggs, F. H.
Helyar, Albert.
Tippett, J. Collins.

Tunbridge Wells.

Bacon, W. Beadell.

Vienna.

Wedl, Karl, Prof.

Walton-on-Thames.

Power, Thos. Henry.

Worcester.

Barkley, W.

Yarmouth, Gt.

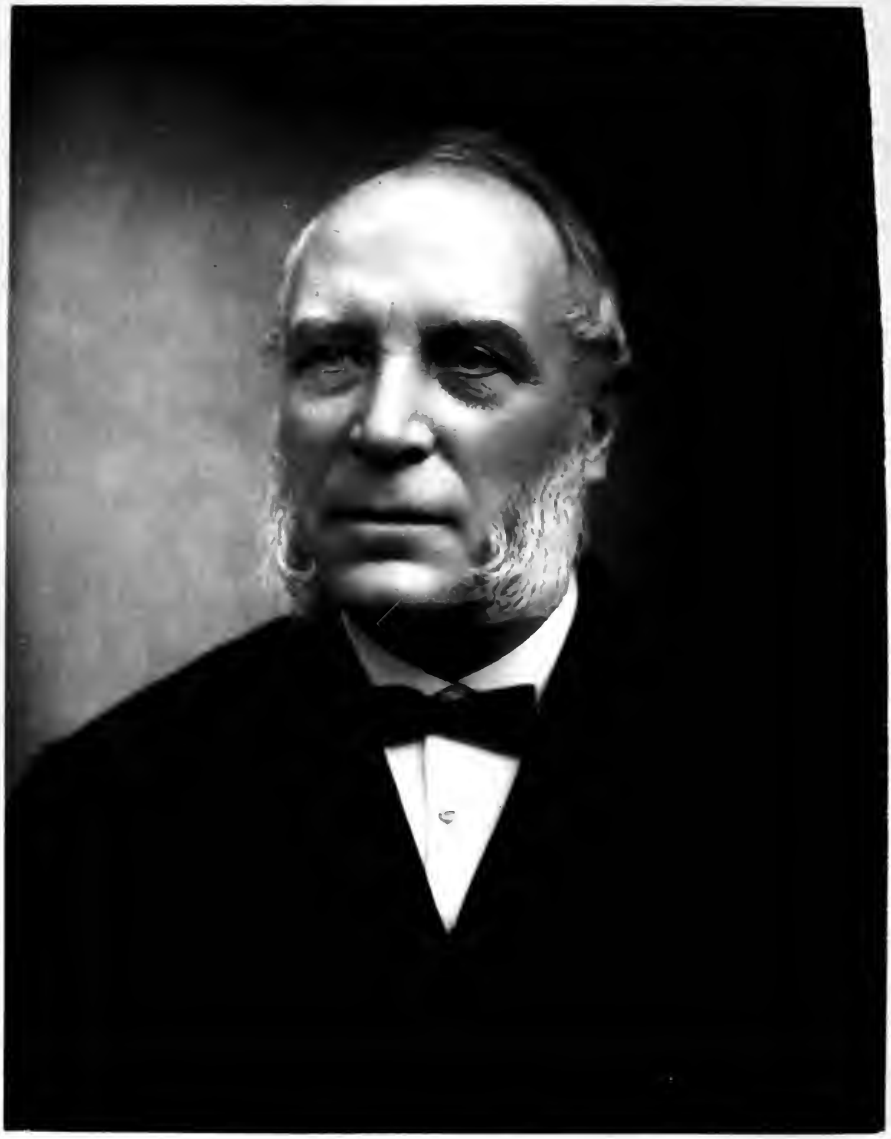
Cobb, John S.

Yeovil.

Hunt, William A.

York.

Glaisby, Walter.
King, Thos. Edward.



BARRAUD, *Phot.* *Woodburytype.*

CHARLES VASEY, L.F.P.S. GLAS., L.D.S., ENG.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

November 4th, 1889.

MR. HENRY SEWILL, M.R.C.S., L.D.S.,
PRESIDENT, IN THE CHAIR.

The following nominations have been received by the Council :—

ROBERT ERNEST WOOD, L.D.S., 1, Seaside Road, Eastbourne.

MARCUS J. BLOOM, jun., L.D.S.I., 18, Westland Row, Dublin.

The CURATOR (Mr. STORER BENNETT) announced the following additions to the Society's collection :—He desired, firstly, to draw attention to the specimens upon the table. One of these was the skull of a young male Singapore unicorn rhinoceros, which was of especial interest from its showing the transition from its milk to its permanent dentition. He remarked that Professor Owen had pointed out that a correlation existed between the incisors and the horns in these creatures. Cuvier and others had shown that in a fossil specimen of an extinct form, in which no horn was present, six incisors existed in the upper and lower jaws. Mr. Bennett reminded the Members that in the unicorn rhinoceros only four incisors were found, whilst in the two-

BARRAUD, *Photo.* *Woodburytype.*

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Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

November 4th, 1889.

MR. HENRY SEWILL, M.R.C.S., L.D.S.,
PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

Mr. HENRY GEORGE READ, having signed the Obligation Book, was formally admitted to membership by the President.

Mr. F. DENISON PEDLEY, F.R.C.S.Edin. M.R.C.S., L.D.S., of 17, Railway Approach, London Bridge, was balloted for and elected a Member of the Society.

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horned rhinoceros they were altogether absent, and since probably a chief use of these structures was for defence and offence, it would look as if developmentally the horn represented the absent incisors. He also showed models sent by Mr. Cormack, of Elgin, of the mouth of a man—Peter Laing—aged 105 years, who possessed five teeth in his lower jaw, but none in his upper. He was in excellent health and came of a long-lived family, his father having lived to the age of 109, and his grandfather was said to have died at 135. Mr. Bennett further stated that he had received for the Society a number of models representing regulation cases, but, as he had only just received them, he proposed, with the permission of the Society, to defer to a later meeting any detailed account. Dr. Talbot, of Chicago, had kindly presented the models.

The PRESIDENT called upon Mr. England to explain his method of opening the antrum.

Mr. ENGLAND said: The patient, having been put under the influence of nitrous oxide gas the opening should be made in the region of the first permanent upper molar. If it is necessary to remove a tooth the operator should select for enlargement and perforation through the posterior buccal root in preference to the palatine, as from the direction of the latter there is danger of either opening into the floor of the nose, if the antral chamber be small, or, if the opening should be successfully made the slanting position it necessitates for the tube, renders the adjustment of the plate difficult to the patient. When no tooth is present the opening should be made in the middle line of the alveolar ridge at right angles to it. For the purpose of making the opening he used a spear-headed drill, in conjunction with the dental engine, of about one-eighth of an inch in diameter and of such a length that while allowing a considerable thickness of tissue to be penetrated before entering the antrum, there is no danger of perforating the floor of the orbit, the nozzle of the hand-piece acting as a stop The opening is then enlarged with a trocar of a size sufficient to ensure the passage of a tube of at least one-

eighth of an inch in diameter; this trocar is fitted with a movable collar, which acts as a stop and prevents it perforating further than desired. A model is then taken in the usual way and a plate made with the tube reaching well into the antrum; the mouth of the tube should be fitted with a screw, so that it can be opened or closed at will.

Mr. W. E. Harding (Shrewsbury) brought before the Society a specimen of dermoid cyst containing hair and teeth. A swelling had existed in the patient's abdomen for about eighteen months, which was diagnosed as a case of ovarian cyst. Mr. Harris, of Shrewsbury, Mr. Harding's colleague, cut down upon the tumour and removed it. Upon puncturing the cyst it was found to have solid contents containing six teeth, a tress of hair and a detached ball of hair, as well as extremely thick pus, which solidified to the consistence of beef dripping. Mr. Harding had made a cast of the cyst, which he presented to the Society. The cyst itself, he regretted to say, he had been unable to obtain, as it was required for a local collection. With regard to the origin of these dermoid cysts, he believed it was generally accepted that they arose from an induplication of the epiblastic layer during early intra-uterine life. This becoming entangled in that portion of the fœtal structures which afterwards developed into the ovary, grew true dermal structures —namely, teeth and hair.

The President remarked he did not recollect any similar case having been brought before the Society. These cysts were very interesting, and although not common were not rare.

Mr. Storer Bennett asked if any Member could afford information concerning the structure of teeth contained in dermoid cysts. He was not aware of any book which gave an accurate description of them, and it would be interesting to ascertain whether they were composed of dentine or what. He thought that if a section of one of the teeth could be obtained and reported upon, it would enhance the value of the communication.

Mr. Hern pointed out that one of the teeth had dropped out of its position in the specimen, and from careful examination it seemed to him to be without a root, looking indeed as if the root had become absorbed.

Mr. George Cunningham (Cambridge) had seen a most remarkable case of dermoid cyst in Buda Pesth, the full particulars of which he hoped to lay before the Society on a later occasion. He would only mention that the cyst appeared to contain both temporary and permanent teeth, and some of the teeth appeared to be carious.

Mr. Hunt (of Yeovil) said that perhaps all the members were not aware of the interesting specimen at present in the collection of the College of Surgeons, which had been placed there by the celebrated Surgeon Highmore, who formerly resided in his neighbourhood. The specimen was one of an encysted fœtus which had been removed from the abdominal cavity of a young man—the point of interest was to decide the question how it got there.

Mr. Harding, in replying, stated that all the teeth appeared very loosely connected with the cyst, as if they were held by ligamentous rather than bony attachment. The teeth of the patient were perfectly normal both in number and structure.

The President then called upon Dr. Felix Semon to read his paper.

Some Points in the Etiology, Diagnosis and Treatment of Empyema of the Antrum.

By Felix Semon, M.D., F.R.C.P.

It is with considerable diffidence that I have, in response to the flattering invitation of your President to read a paper before the Odontological Society of Great Britain, selected the subject of Empyema of the Antrum. The reasons for this diffidence are not far to seek: in the first place, my personal experience with regard to this disease is very limited; secondly, none of the cases I have observed have shown any unusual symptoms or offered other points worthy of detailed description; thirdly, the views on the whole subject of empyema of the antrum are at this moment in such a state of fluctuation that any opinions about it which may be offered to-day may be antiquated to-morrow.

If, nevertheless, I have ventured to select it, it is just the last-named circumstance which has prompted my choice. The discrepancies of opinion as to the etiology, diagnosis and treatment of this important and troublesome affection are so great that I hope it may be acceptable to a

society of experts to have laid before them a review of the present state of these questions. I wish particularly to state at the onset of my remarks that they cannot lay any claim to originality; all I aspire to is to draw attention to those points concerning which it would appear most desirable that a greater consensus of opinion should soon be obtained.

Added to this paper will be found a bibliography, in which the more important papers which have been published since the revival of interest in the question three years ago are enumerated; references to mere casual contributions will be found in the *Internationales Centralblatt für Laryngologie, Rhinologie, &c.*, from 1886 to the present day.

Before entering upon a discussion of the etiology of the affection, it may be well to say a few words concerning its frequency. Empyema of the antrum well illustrates the truth of the saying that there is "fashion in disease" as well as in other things. Whilst up to the commencement of 1886 only a few isolated instances of the affection will be found scattered here and there through medical literature, at the present time we not only have a large special literature on the subject, but careful and trustworthy observers, such as B. Fränkel, Moritz Schmidt, Heryng and others do not hesitate to say that the disease is a

"frequent" one. Fränkel states that he has operated upon seven cases within three months; Schmidt made the diagnosis of empyema sixteen times within five months; Heryng diagnosed "with certainty" ten cases within six months. The experiences of these and other observers, however, are completely overshadowed by those of Ziem, of Danzig, to whom the revival of the whole question is due, and who states in a second communication, published in April of last year, that he has opened the antrum in not less than 227 cases. As in his first paper, published in April, 1886, he speaks of thirty-six cases only operated by him so far, it follows that he must have seen no less than 191 cases within two years. The only explanation of this astounding number which suggests itself to my mind is that in consequence of his first communication, which has, no doubt, attracted a great deal of attention everywhere, many practitioners must have sent him cases. My own experiences so far do not lead me to subscribe to the comparative frequency of the affection. I have no doubt it is more frequent than has been formerly supposed, and I can but re-echo Schmidt's and Heryng's statements in confessing that I have, in former times, probably left more than one case of empyema of the antrum undiagnosed, but I have, ever since having read Ziem's first paper immediately after its publica-

tion in 1886, been on the look-out for instances of this kind, and I do not think that I have since allowed such cases to slip by undiagnosed. However, all I can say is that within the last three and a-half years, with a material of several thousand cases of throat and nose affections, I have certainly not seen more than a dozen cases of antrum disease in private practice, and in several of these the diagnosis remained doubtful. The future will, no doubt, throw more light upon the question of the comparative frequency of the affection.

Now with regard to etiology.

Theoretically there is, of course, no reason why occasionally the suppurative process should not commence in the antrum itself, and a few cases probably actually originate in this fashion. In the great majority of cases, however, the antrum is but secondarily affected—the pathological process starting either from the nose or from the teeth. The situation and anatomical relations of the antrum lend themselves to both modes of origin. Whilst on the one hand it opens into the middle meatus of the nose through the ostium maxillare, and whilst it is lined by mucous membrane directly continuous with that of the nose, on the other hand, the alveoli of the two bicuspids, of the first molar and often also of the second molar and the canine tooth are separated from the

mucous membrane of the antrum only by a very thin layer of bone. These alveoli are usually visible from the antrum in the shape of rounded projections. Sometimes the roots of the teeth actually perforate the bone and are covered by mucous membrane only. In such cases mere extraction of a tooth may open the antrum. (Fränkel.)

Under these conditions it is evident that any inflammatory process affecting either the mucous membrane or the bones of the nose, or, on the other hand, the roots or the periosteum of the teeth, or the alveoli themselves, may be propagated into the antrum, and there set up purulent inflammation. Both possibilities are, of course, not denied by any author, but opinions and experiences most markedly and curiously differ as to their actual comparative frequency.

Zuckerkandl, in his classical work on the normal and pathological anatomy of the nasal cavity, says: "Most by far of the inflammations of the mucous membrane of the maxillary sinus are propagated from the mucous membrane of the nasal cavity. Here it is that the affection first begins and spreads; in its further course it extends to the mucous membrane of Highmore's antrum. The vascular connection of these cavities is so intimate that the one often reacts in the form of congestion of the mucous membrane,

even upon the slightest affection of the other. It is true that the mucous membrane of the maxillary sinus may become inflamed, also from disease of the maxillary bones; it is equally known that it may become affected through hyperacute affections of the teeth and their alveoli; B. von Langenbeck even saw purulent blennorrhœa of the maxillary sinus occur in two cases after section of the infra-orbital nerve, performed after Malgaigne's method, in which the lower wall of the orbita is incised. But this mode of affection of the maxillary sinus is rarer than that propagated from the nasal cavity, and I have, so far, only once had the opportunity of observing it."

In opposing this view Fränkel states his case as follows: "I cannot agree with Zuckerkandl, so far as empyema is concerned. Although I have but small anatomical experience on this point, clinical observation has shown me that in the overwhelming majority of the cases of empyema which I have seen, affections of the alveoli of the teeth have formed the cause of the disease. An instructive example of that mode of production of empyema, which I must consider as characteristic for most of the cases observed by me, is the history of Ziem's own case. This author states that he acquired his own fœtid blennorrhœa of the nose by a plug of cotton wool having remained too long in one of his molars,

which was carious up to the top of one of its roots. Similar conditions obtain in most cases. The patients, for instance, suffer from chronic alveolar periostitis. As a rule the secretion flows away when formed, through the channel of the root. If this, however, should become obstructed by particles of food or anything else, retention of the secretion occurs, as a rule combined with slight quickly-passing pain. The diminution of pain indicates the perforation of the secretion into the maxillary sinus. That such was the mode of origin in my own cases was rendered likely sometimes by the direct observation of the patient, sometimes by the fact that in not a single case of empyema of the antrum I have seen such a tooth had not either been extracted or was still present showing the affection just described."

Fränkel then combats the view that in such cases the order of events might have been just the reverse, *i.e.*, that purulent inflammation of the antrum might have *caused* periostitis and caries of a tooth, and in conclusion of this part of his paper adduces as a further argument in favour of his own view the undeniable fact that of all the accessory cavities of the nose the antrum is by far most frequently the seat of purulent catarrh. This can only be explained by the alveolar origin of the inflammation.

Finally he mentions that the nature of the secretion itself speaks against its nasal origin, for in cases of true empyema of the antrum the discharge is always *purulent*, whilst in the nose itself no purulent secretion is formed at the same time.

In spite of these clear, important and, as it appears to me, convincing arguments, the views of authors are still curiously divided on this point, although the experiences of by far the greater nnmber agree with Fränkel's views. Thus Christopher Heath, Lublinski, MacBride, Krieg, Fletcher Ingals, Moritz Schmidt, Schech, Walb, Bayer and Heryng state that in the majority of their own cases the disease evidently started from the teeth.

Schech mentions more specially caries, above all caries of the roots, alveolar periostitis, granular odontitis, formation of fistulæ, deficient dentition, ingrowth of teeth into the maxillary sinus and pushing them into the cavity during clumsy attempts at extraction, amongst the dental causes of purulent catarrh of the antrum, and Walb additionally accuses excessive attempts at conservation of decayed teeth, bad filling and retention of stumps underneath artificial plates.

On the other hand Ziem, Bronner of Bradford and Krause of Berlin lean more towards Zuckerkandl's view, and Friedländer, Krause's assistant, mentions in a recently-published paper

that amongst sixteen cases of empyema treated by Hartmann of Berlin there was but one in which the affection was due to affection of the teeth. Bayer of Brussels, although agreeing that the dental and alveolar origin of the disease is the more frequent one, draws special attention to the frequency of the combination of nasal polypi with purulent catarrh of the antrum. In twenty-five cases of the latter affection he six times found nasal polypi, and in at least two of these combination cases the teeth and the alveoli were absolutely healthy. He explains the antrum disease as due in these cases to obstruction of the nasal opening of the sinus by the polypi and to retention of the secretion, a view which is probably correct.

My own experiences are distinctly in favour of the dental origin of the affection; although in several cases the etiology was rather obscure, in the majority the commencement could be clearly traced to affections of the teeth, and I have not seen a single case in which a nasal origin could with certainty be established.

The question wants further elucidation. It is not merely an academic one, but, as will be shown further on, of great practical importance with regard to the best mode of treatment of the affection. So far, I think, the balance is in favour of those who believe in the greater

frequency of the dental origin; further experience will, no doubt, satisfactorily settle this point.

We next come to the question of diagnosis, and I shall limit my remarks here to the diagnosis of *chronic* empyema, speaking first of those cases in which *no* obstacle exists to the discharge of the purulent secretion of the antrum into the nasal cavity, and secondly, of those cases in which the ostium maxillare (hiatus semilunaris) is *obstructed*.

To Ziem, undoubtedly, is due the merit of having shown, on the one hand, that certain symptoms, which had been handed down from generation to generation as characteristic of empyema of the antrum, are by no means necessarily connected with that disease, and of having on the other hand drawn attention to the importance of other, formerly much neglected, in reality, however, almost pathognomonic signs.

Amongst the former are (1) distension of the sinus, (2) increased secretion when lying on the healthy side, (3) pain in the infra-orbital region, (4) inflammatory swelling of the corresponding cheek. It is, of course, not denied by Ziem that all these symptoms may and do occur, singly or conjointly, in empyema of the antrum, but by the description of his first series of cases he has incontrovertibly shown that well-

developed empyema often exists without any of these symptoms being present.

The symptoms, on the other hand, to which little attention had formerly been paid, and the importance of which has been emphasised by Ziem, are the *onesidedness* and the *periodicity* of the purulent discharge. The former of these symptoms will, of course, not obtain in cases in which *both* maxillary sinuses are affected, but such cases are according to universal experience exceedingly rare, and do hardly count in comparison to the frequency of the unilateral affection. In a few cases, again, the discharge is continuous, but this also is only an exception to the rule. In the great majority of cases in which the nasal opening of the antrum is not obstructed, the disease is characterised by unilateral, periodical discharge from one nostril, the nostril being, of course, that corresponding to the diseased antrum, and the periodicity corresponding to the different positions of the patient's head. As the ostium maxillare is situated comparatively high above the floor of the antrum, it is obvious that secretion can only take place when the cavity is either almost full, or when the patient's head is being held in such positions that its emptying into the middle meatus is facilitated. In consequence of these anatomical conditions the pa-

tient's statements often are very characteristic. Frequently the complaint is heard that whilst at night, *i.e.*, when the patient lies in a recumbent position, and the purulent matter thus, of course, gravitates downwards, there was an almost constant trickling of foul secretion into the *throat;* on the other hand, in the morning, as soon as the patient bent his head slightly forward, as in writing, pus either trickled or streamed in a current from one *nostril.*

A further characteristic circumstance is the fact, that the secretion is almost always fœtid, that the fœtor is perceptible to the patient himself, and that it is, indeed, perceived by him much sooner than by other people.

Quite different from cases of ozæna, the physician, when examining the patient's nose and when compelled to be quite near him, often in cases of empyema perceives hardly anything of the terrible odour, which not rarely forms the patient's most prominent complaint. That the latter, however, is not imaginary, is proven, when in such a case the antrum is opened and often horribly stinking pus is evacuated. Not rarely a putrid taste in the mouth, with nausea and want of appetite, are complained of, but this is not constant.

Equally inconstant are neuralgic sensations of very varying character. The most frequent

of these is a dull heavy pain which, curiously enough, is not nearly so often felt over the diseased part itself as in the region of the frontal sinuses. The true significance of this form of headache, therefore, would appear to be an important diagnostic matter, else the frontal sinus may be opened, whilst the disease is actually in the antrum.

Sometimes there is transitory swelling of the cheek over the affected part; Mac Bride has in two cases seen distinct swelling of the gums.

Not often pain at the bridge or root of the nose, in the cheek, in the ears, in the teeth, is complained of; more frequently, however, depression, inability and disinclination for mental work, hypochondria, general derangement of health, &c. In some cases it is remarkable how much the patient's general health and spirits appear to have suffered from what may be thought so trivial an affection.

Summarising the subjective symptoms of this class of cases, viz., in which free discharge of the secretion can take place, it may be stated that if an adult patient complains of unilateral, periodical, purulent, fœtid discharge from one nostril, sometimes combined with various forms of neuralgic headache, nausea, depression of spirits and general derangement of health, the practitioner should always think of disease of the accessory

cavities of the nose, in the first place of the antrum.

Of the objective symptoms under such circumstances by far the most important is the actual observation of the discharge of pus from the opening of the antrum. Sometimes it is possible, with good illumination and after introduction of a nasal speculum, to see without further preparation pus in the middle meatus, *i.e.*, between the middle and lower turbinated bones, or between the middle turbinated bone and the external wall of the nose, running downwards in a small, thick or thin, yellow or whitish stream, whilst the rest of the nostril, especially the *upper* portions, appear perfectly healthy. In other cases in which the mucous membrane of the nose is much swollen, previous cocainisation may be necessary, or the swollen mucous membrane of the middle turbinated bone may have to be pressed aside with a blunt probe before pus will make its appearance. Schoeller and Walb have drawn attention to the fact that in such cases sometimes a pulsating light reflex is seen on those parts of the nasal mucous membrane on which first the fluid will appear, analogous to the pulsating light cone on the tympanum in cases of otitis media.

However, even if pus should be seen in the region corresponding to the ostium maxillare of the antrum, the objection might still obtain that

it had by accident found its way just to this part, and that it may actually come from one of the other accessory cavities of the nose. The most important feature, therefore, in establishing a certain diagnosis will consist in actually demonstrating, in all cases, the direct passage of the matter from the antrum—a procedure which is simply indispensable, when the patient has carefully cleaned his nostrils just before consulting the practitioner, or when all the secretion having been evacuated in the morning, not so much accumulation has yet taken place at the hour of the consultation that the secretion could be spontaneously discharged into the nose.

The method of investigation is very simple. The nose having been thoroughly cleansed, and it having been ascertained by inspection that the nostril corresponding to the suspected antrum is quite free from secretion, the patient is told to lie down across a chair or on a sofa, supporting himself with both hands on the floor, head downwards, *but not too low*, and the *affected* side *uppermost*. After remaining for about ten to fifteen seconds in that position he is at once to resume his position in the chair without either blowing or inspiring through his nose. The speculum having been re-introduced pus will be seen in the middle meatus in greater or smaller quantity, if the discharge really comes from the

antrum. This simple and useful procedure has been introduced by Bayer and B. Fränkel. I would especially recommend (1) that the head be not held *too low;* (2) that the patient does not remain *too long* in the inverted position, because the purulent secretion, if thin and abundant, is apt to gravitate under such circumstances into the *upper* parts of the nostril, when it may be impossible to ascertain from *which* of the accessory cavities it actually comes.

It goes without saying that all the signs and means of diagnosis so far mentioned, which are referable to the discharge of the secretion into the nose, will only be available when such a discharge can take place, *i.e.*, when the ostium maxillare of the antrum is unobstructed. Obstruction of this opening greatly modifies both symptoms and means of diagnosis. Such an obstruction may be caused by the very thick, creamy consistence of the pus, especially if the opening be naturally narrow, by swelling or hypertrophy of the nasal mucous membrane in the neighbourhood of the ostium, by nasal polypi or foreign bodies in the nose occluding the opening, or by the formation of granulations around it, &c.

In such cases the symptoms which were formerly held to be characteristic of the affection and which have been mentioned above, are found more or less developed.

If the exudation be at all considerable, the sinus becomes distended and its walls greatly thinned. The zygomatic region, the hard palate, the fossa canina, the inner wall, the alveolar region above the molars, the parts just below the orbita—any of these may bulge considerably forward and give the finger the sensation of crackling or of an elastic swelling. In extreme cases complete occlusion of the corresponding nostril is being produced by distension of the inner wall of the cavity, or the bulbus is pushed upwards and exophthalmos ensues. If communication with the nose is not re-established under such circumstances perforation may occur anywhere and a fistula be established in the gums or in the hard palate, &c. In almost all cases in which free secretion is impossible, violent neuralgic pains in the face and in the teeth of the upper maxilla of the affected side are complained of. Swelling of the soft parts of the cheek, sometimes of an erysipelatous character, also occurs.

In many cases the obstruction is not of a permanent, but of a transitory character. In such cases the patient, whilst suffering acutely during the time of obstruction, is greatly relieved as soon as from some cause or other the ostium becomes temporarily free and the purulent secretion finds its natural outlet into the nasal passages. Often, however, after a short time

the opening becomes again obstructed, the old symptoms return and a fresh period of suffering occurs, to be terminated again by discharge of the accumulated secretion into the nose. Thus the affection may and does often exist for many years with alternating improvement and aggravation.

I have but briefly touched upon the cases in which actual distension of the walls of the cavity or fistulæ exist, for the reason that in these cases the diagnosis will as a rule offer no difficulties. Much more difficult, however, is the diagnosis in cases of temporary obstruction of the semilunar hiatus, or in such cases of nasal discharge in which, though the symptoms decidedly point to the passage of the pus from one of the accessory cavities of the nose, it cannot be made out with certainty, owing to excessive narrowness of the nasal cavity or to swelling or thickening of its mucous membrane, or to the presence of nasal polypi, &c., which of these cavities, the maxillary sinus or the ethmoidal cells, the frontal or the sphenoid sinus is the affected part. It must also not be forgotten that several of these cavities may be *simultaneously* diseased.

In such cases a great many measures have been recommended, calculated to demonstrate the actual provenience of the pus from the antrum. Thus Stoerk, Bayer, Hartmann and others have recommended to introduce, after previous cocainisation,

a fine syringe or a slender ear-catheter through the middle meatus into the natural opening, viz., the semilunar hiatus, and to inject through it some antiseptic solution with the triple object of clearing the obstructed opening, of demonstrating the source of the secretion, and of healing the suppurative process itself. Though it cannot be doubted that in a small number of cases this procedure is perfectly feasible, in the majority of cases it will be found, owing to the anatomical conditions of the parts, that it is very difficult, often impossible. Michel recommends forced injection of water into the nose, in the hope that the obstruction of the ostium maxillare, if only due to inspissated matter, will give way. With the same object in view Hartmann uses the air douche, in the form of Politzer's bag. To this Ziem objects, arguing that parts of the foul secretion from the antrum may thereby be forced into the middle ear and may there set up serious purulent inflammation. He therefore employs for the same purpose a catheter, which is introduced through the mouth and upwards behind the palate, and which is connected with an air balloon. By compression of the latter whilst the patient closes both nostrils condensation of the air in the cavity is obtained in the direction from behind forward, and the danger indicated by him is avoided. Hopmann, Stoerk and Walb suggest the introduction of cotton plugs or of

laminaria bougies into the middle meatus. Link recommends percussion of the antrum. He presses a rounded stick made of wood, of about a finger's length, against the hard palate close to the second molar and percusses the free end with his finger. According to his experiences a clear sound is heard under normal conditions which becomes dull when there is fluid in the antrum.

Inasmuch as none of these methods can boast of universal success, though each of them has, no doubt, given satisfactory results in a number of cases, comparatively often the exploratory opening of the antrum becomes necessary. This may be either performed from the alveolar process or from the nose. If one of the teeth, the alveoli of which are known to be in close proximity to the floor of the sinus, be diseased, it will be most natural to remove the tooth and to penetrate by means of a drill or of a trocar through the alveolar process into the cavity. A similar procedure may also be adopted if the teeth should have been already previously drawn, provided that there is not too much shrinking of the upper maxilla. Ziem even recommended formerly the probatory removal of a *healthy* tooth, if necessary. Against this proposal, however, much opposition has been raised, and in his last communication he supplants his former recommendation by the proposal to open

the antrum *between* the two bicuspids or between the second bicuspid and the first molar by means of a dental engine, and of a *very* fine drill of a diameter of one and a-half mm. and of two to three cm. length. He states that by means of this procedure he has sometimes been able to open the antrum in from five to seven seconds, and that no damage is done to the patient. Tornwaldt, however, at the last meeting of German naturalists, demurred to the last-named statement, and said that the operation was frequently difficult, not free from risk, and often directly *productive* of suppuration in the antrum. To obviate the establishment of a communication between the antrum and the cavity of the mouth for mere exploratory purposes, Krause, Schmidt and Tornwaldt recommend exploratory punction through the *inner* wall of the antrum, by way of the lower meatus of the nose. Krause avails himself for this purpose of a specially constructed trocar, which is pushed into the antrum after previous cocainisation through the nose, below the lower turbinated bone, as far as possible backwards; Schmidt uses a strong curved syringe and Tornwaldt a small trephine, which is put into motion by a winch. The last-named method has only so recently been introduced that no opinions have yet been expressed as to its usefulness; of

Krause's trocar it is stated by Heryng that in his cases it could not be used, owing to narrowness and swelling of the lower parts of the nose; and as to Schmidt's syringe I can only say that in one of the two cases in which I have attempted to use it I did not succeed, in spite of using considerable force in perforating the very thick internal wall of the antrum, and that in the other I drew only blood, although on subsequent opening of the cavity through an alveolus pus was found in the antrum. Of course, the number of my experiences is much too small to base upon them any condemnation of the method, but I thought it right to mention them, in order to show that this otherwise simple and safe method can as little boast of applicability in all cases as apparently most of the other procedures which have been recommended.

That our diagnostic powers at the present time are still far from being satisfactory is evident from the number of cases in which the antrum has been opened and no pus has been found. Thus so experienced an observer as Ziem states in his latest contribution that he did not find pus in the antrum in nine per cent. of the last sixty-seven cases in which he opened the antrum by means of the dental engine!

Under these circumstances it would be a real boon, if the latest addition to our diagnostic means,

which has quite recently been made by Heryng, should fulfil the high expectations which this distinguished author entertains. Acting upon a suggestion the merit of which belongs to the late lamented Professor Voltolini, Heryng has, in ten cases observed by him within the last six months, with certainty diagnosed empyema of the antrum by electric transillumination (if I may coin that word) of the face. For this purpose he introduces in a *perfectly dark* room a small incandescent lamp of *at least* five volts., attached to a tongue depressor, into the patient's mouth. The patient closes the mouth, and the electric current is established, when the bones of the face, according to Heryng's experience, are perfectly lit through, and appear up to the orbit bright red. Now, if there should be empyema of the antrum, the affected side *remains dark*, and the diagnosis is secured. Only in one case did he not succeed, owing to abnormal thickness of the bones of the face. For further particulars I must refer you to the original. I have not yet had the opportunity of testing the method, but a recommendation coming from Heryng must always command attention, and I can only repeat that, if the future should show the general applicability of the method, a great boon will have been conferred upon both patients and practitioners.

I finally come to the question of treatment.

Up to the beginning of 1886 three methods were used:—

(1) Simple drainage through the natural opening.

(2) Opening of the antrum through an alveolus (Cooper's method).

(3) Opening of the antrum through the fossa canina (method of Desault-Küster).

In 1886, almost simultaneously with Ziem's first publication, Mikulicz, then of Krakau, now of Königsberg, recommended opening the antrum through the lower meatus with a specially constructed stiletto, and shortly afterwards Krause introduced, instead of the latter, the trocar above referred to. Of these four methods the drainage through the natural opening has found but few adherents and given not very encouraging results. This is easily intelligible, from the previously mentioned difficulty of introducing catheters, &c., into the hiatus, and also from the fact that the opening is situated so high above the floor of the cavity. Free drainage, therefore, is difficult under all circumstances, and the treatment can hardly be carried out by the patient himself, even if, in accordance with Bayer's proposal, the ostium should have previously been enlarged by means of the galvano-cautery or otherwise.

Also the last-named method, the opening from

the fossa canina, has met with but little favour, though Christopher Heath and Morton Smale have had good results with it, whilst quite recently Schech has stated that, especially in very obstinate cases, which resisted all other forms of treatment, he has finally obtained a cure by drilling a comparatively large opening through the fossa canina into the antrum, and plugging the cavity with iodoform gauze.

The real battle, however, has been and is being fought ever since 1886 between the method of opening the antrum through an alveolus and that of opening it from the lower meatus. The opinions as to the preference of each of these methods are just as curiously divided as those on the etiology and on the best mode of diagnosing the disease. Whilst Mikulicz, B. Fränkel, Krause, Friedländer, Bronner and Schiffers prefer the route through the nose, Christopher Heath, Ziem, Schmiegelow, Krieg, Fletcher Ingals, Bayer, Heryng, Greville Macdonald, Schech prefer the alveolar operation, and Moritz Schmidt has returned to it, because his patients often found it difficult or impossible to carry out the after-treatment.

At the present moment the contest is as fierce as ever. The adherents of the alveolar method claim for it (1) that in many cases, in order to get rid of the *fons et origo mali*, the extraction of

one or several carious teeth is *ipso facto* necessary, and that it is, therefore, natural that the simple act of perforating through the alveolus should at once be added to the removal; (2) that the opening thus produced corresponds to the most *dependent* part of the cavity, and that the drainage, therefore, will be most perfect; (3) that the patient can easily carry out the after-treatment himself. The opponents, on the other hand (*e.g.*, Friedländer), argue (1) that often a healthy tooth had to be drawn; (2) that the constant running of pus into the mouth was a source of great annoyance to the patient; (3) that by creating and keeping open a communication between antrum and mouth, the entrance of particles of food and of pathogenic micro-organisms of the oral cavity into the antrum was facilitated and the suppuration in the latter actually kept up.

To my mind the arguments of the adherents are not counterbalanced by those of the opponents of the method. I can only state that I have never seen suppuration of the antrum co-exist with a perfectly healthy set of teeth, and that, though I do not in the least doubt its occasional occurrence, I am convinced it does not occur "often." That in the rare cases in which the teeth are found healthy the operation from the nose, if practicable, may be preferable, I will not

for a moment contest; but I fail to see why the exception should be made the base of the attack against the more natural method in the majority of cases.

With regard to the second objection, viz., that the running of pus into the mouth was a source of great annoyance to the patient, I must say that I have never heard that complaint from any of my patients who have been operated upon by the alveolar method, and I do not think that there is so much difference between a constant annoyance to the gustatory and the olfactory nerves that this could much influence one's decision; for it must not be left out of consideration that if the discharge runs into the nose instead of into the mouth, the patient will continue to suffer from the trouble for which he has consulted the practitioner, viz., the unpleasant odour, so long as the discharge is fœtid, in addition to having to use his handkerchief almost constantly.

The third objection, viz., that by the establishment of a communication between antrum and oral cavity, food and micro-organisms penetrated from the latter into the former and kept up the suppurative process, would certainly weigh very heavily with me, if it could be only shown, (1) that this really occurs, (2) that the operation from the nose is *superior* to that from the mouth

in that the suppuration sooner ceases and the after treatment is curtailed. For it cannot be denied that the long duration of the after treatment is the weakest point in our present system. Though occasionally the suppuration ceases a few weeks after the operation, especially in comparatively recent cases, under the use of mild, tepid, antiseptic and disinfectant solutions (carbolic acid, borax, iodine, salt, permanganate of potash, &c.), by means of Christopher Heath's apparatus, yet there are, unfortunately, other cases, in which the suppuration, in spite of free drainage from the mouth through the antrum and the nose, continues for many months. Here certainly an improvement would be *most* desirable.

But what I fail to see is (1) that it has actually been shown that micro-organisms, &c., enter the antrum when the opening is properly made, when a suitable cannula is inserted and when its lower opening is closed at meal times, and (2) that when the antrum is opened through the nose the after treatment is remarkably shorter. In the same paper in which Friedländer attacks the alveolar method, he confesses, in pleading for the nasal operation, that "further observations have shown that a true cure of the disease could only be obtained in rare, more favourable and more recent cases." This, surely, shows no su-

periority of the nasal over the alveolar method! Friedländer finds the cause of the failure apparently in the irritation of the mucous membrane of the antrum, caused by the frequent injections of *fluids*, and reports that the results have been much more satisfactory since these injections have been replaced, after *one* thorough injection of water and cleaning of the cavity from pus, by insufflations of iodoform. I think myself that this would be an important advance, if further observations should corroborate Friedländer's statement; but it need not be said that the *dry* method could just as well be employed from an opening made through an alveolus.

To avoid all misunderstandings I beg to say distinctly that I personally have no theoretical objections to the nasal operations as such, and that very possibly my present views may be changed some day; but if one hears from trustworthy observers that sometimes considerable hæmorrhage is caused by them, that comparatively often, in consequence of narrowness of the passages or of thickness of the nasal bones, their performance is difficult or even impossible, that many patients have considerable difficulty in carrying out the after treatment, &c., one is the less inclined to give up a tried method in their favour, if one remembers that in the majority of cases defective teeth have to be extracted in order to

remove the source of the whole trouble, and that thus the first and most severe act of the alveolar operation has anyhow to be performed.

The near future will probably teach us more precise indications for the selection of the best method in each individual case. I have, so far, been satisfied enough with the results of the alveolar operation. One point regarding treatment in which further improvement would be most urgently desirable is, as mentioned before, curtailment of the after treatment. In very obstinate cases in which, in spite of long-continued fluid or dry antiseptic injections through an alveolus no cure results, I shall in future probably either establish a large opening above the canine tooth, and plug the cavity with iodoform gauze, as suggested by Schech, or make an additional opening in the lower meatus of the nose, as recently proposed by Michelson and Mikulicz.

I should have liked to enter in greater detail upon a good many points which I have barely touched upon, but my paper has, I fear, already attained an excessive length. It will have served its purpose if it has succeeded in drawing attention to some of the most contested points in the etiology, diagnosis and treatment of empyema of the antrum, and in possibly indirectly assisting in paving the way for improvements in these respects.

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Discussion.

The President felt it was hardly necessary to formally give expression to the thanks of the Society to Dr. Semon, for the applause testified to their gratitude. To busy practitioners, the practical must always possess charms of its own. He proposed to reserve his remarks unt others had spoken; he might, however, say in opening the discussion that he believed empyema of the antrum to be far more common than was usually suspected. He had not, however, always entertained this view, for formerly when he was attached to a large general hospital and working amongst its out-patients, with the keenness of a young man, the cases that had come under his notice were so few that he had been led to say that they were rare, and that either acute or chronic inflammation was seldom seen. In private practice, however, he had now seen with Dr. Semon and others a good number of cases, and hence he had come to the conclusion that although those cases were not common they could not be deemed rare. They were very important cases, needing close study and attention, as they were often not diagnosed and the patients allowed to go on with their condition unameliorated. He would, however, not say more, but call upon Mr. Christopher Heath, who amongst surgeons had done more work than most in treating diseases of the jaws.

Mr. Christopher Heath said he rose in obedience to the call from the chair. He was aware that much had been done upon this subject by foreign observers, but he was surprised, after hearing Dr. Semon's most valuable compendium of what had been done, to find how little advance had been made upon the classical account given by Hunter. He thought it should be carefully borne in mind that the purulent discharge from the nostril was not by any means always due to antral disease. Indeed it was remarkable

how seldom ordinary catarrh seemed to attack the antrum, even when it spread to the frontal sinuses. His experience led him to the belief that diseases affecting the nose seldom led to antral trouble, but that this was practically always consecutive upon disease affecting the teeth. In reference to the necessity for removing healthy teeth, to which reference had been made, it did not appear to him to be at all necessary, because antrum trouble was seldom associated with healthy teeth, and further, because it was easy to tap the antrum by a method he had commonly adopted—namely, by a puncture above the alveolus, which answered very well. The opening secured, he had found washing out was easily effected through an ordinary Eustachian catheter, and the patient very soon learnt to insert the catheter for himself and wash out his own antrum. By sitting before a looking-glass the puncture hole could readily be seen, and most persons were thus enabled to carry out satisfactorily the after treatment for themselves, or even, if they failed, a servant could easily perform the service for them. He found, however, that as a rule the syringing out was most inefficiently performed even when properly prescribed. A small vulcanite, or—even worse from its liability to break—a glass syringe was often used and the antrum hardly cleared. He employed a much more powerful injector, and instructed his patients not to be contented unless a really full stream found its way into the nose from the cavity. Mr. Heath felt some disappointment that Dr. Semon had been unable to mention more about antral empyema in connection with those cases in which the nasal aperture was either very small or altogether absent, as these cases gave surgeons much trouble from the extreme difficulty in arriving at a certain diagnosis. He had personally no experience of electric illumination of the antrum, but felt very considerable doubt as to its utility in the majority of cases. From a long experience with bones he believed they varied so much in their degree of thickness that no certainty would be felt if the antrum remained dark in spite of the electric lamp. He should be little inclined to base a diagnosis of the presence of pus on this method. The crackling of the antral walls,

which had been alluded to as a symptom of empyema, was, he believed, rather a sign of cystic disease than of pus in the antrum, as the thinning of the walls leading to crackling could only occur if the pus had been unable to escape for a very prolonged period. He believed empyema was often overlooked or not diagnosed, and in many cases operations were undertaken to relieve supposititious diseases of the nose and nasopharynx, which of course failed, as the true cause of mischief—the empyema—was overlooked. A case in point was that of a young and good-looking widow, who was under a distinguished practitioner, well versed in naso-pharyngeal surgery, and who was put under more than one operation for the relief of post-nasal adenoids and other supposed causes of her suffering, but all in vain. At length it was determined to trephine the frontal sinus, but fortunately the lady and her friends asked for a further opinion before the disfigurement was submitted to. Upon the lady coming to Mr. Heath, he recognised her case to be one of empyema of the antrum, and advised the ordinary operation instead of the trephining. As soon as the antrum was tapped and drained her symptoms ceased, and she got quite well. He must, however, confess that although some cases were pleasant and satisfactory others were not so, but lingered on for years in spite of the utmost care and attention. Some of these cases he believed were due to too much washing-out of the antrum, as these were liable to keep up irritation and cause chronic disease. He should very much like to learn when it was really safe to allow the opening to close, for his experience went to show that if it were allowed to close it was often necessary to make a fresh opening, and if it were maintained patent very long the condition became chronic.

Mr. Wallis said he had during ten years gained considerable experience of the cases under discussion. He quite agreed when it was said nearly all the cases were caused by the diseased conditions of the teeth. He had, however, quite recently met with an instance of empyema following disease of the nose, the teeth being perfectly

sound. He described a case lately under his observation in which he had opened the antrum after removing a tooth, and syringed the cavity out for a week; at the expiration of that time the patient went to America perfectly healed. The tube was worn for three weeks, but as no discharge occurred the patient, with Mr. Wallis's consent, left off wearing the tube. In two days' time the disease recurred without any apparent cause; the tube was reinserted and the patient again recovered and remained well so long as the tube was kept in. Cases in which all the teeth were sound being extremely rare, there was seldom, if ever, any necessity for the extraction of a sound tooth, since if careful search were made it was pretty sure to reveal that one or more teeth were carious. Again, his experience had taught him that even if the tooth which had caused the antral mischief had been extracted, that condition might persist for many years—in one case with which he had met, for fifteen years. An important point in diagnosis of empyema was that, as Dr. Felix Semon had mentioned, the patients were themselves aware of the fœtid smell of their discharge and often sought relief simply on account of it. In this particular a difference existed between that condition and ozæna in which, while the discharge was most offensive to the patient's friends, he himself was unaware of its fœtor. Mr. Wallis thought that in cases of doubt it was advisable to make an exploratory puncture into the antrum, as the proceeding was harmless even if no pus were detected. Quite a small drill should be used. Sometimes he had found that even when no pus was detected at the time of the exploration it flowed from the puncture later on, so that he felt it was desirable when a purulent discharge occurred from the nose to puncture the antrum.

Mr. Henri Weiss thought that a peculiarity of the anatomical structure of the antrum might in some cases help to explain why pus was often not struck by puncture. It was by no means rare for the antrum to be divided into loculi by septa more or less complete, so that pus might exist in one or other of these, and unless the puncture

were made into the particular division which was affected failure would result. If this anatomical fact were borne in mind, Mr. Weiss thought that it might be justifiable, when one puncture failed, to attempt to reach pus by making other openings.

Mr. CUNNINGHAM thought that if it were important to determine the question as to the alleged increased frequency of the disease, they could help the author by giving him the results of their own practical experience. During twelve years' practice in England he had not met with one single case amongst his own patients. The only cases he had treated had been two referred to him by London dental practitioners. Case I. was of the favourable type, a Cambridge undergraduate, aged twenty-one, with a copious offensive discharge from the right nostril. The alveolus over the three upper first molar roots had been the seat of frequent slight abscess formations. No pus or discharge was observable on extraction of these roots. The mesio-buccal socket was considerably absorbed, and the insertion of a drainage tube into this socket, followed by almost daily irrigation with common salt solution, and later on a very dilute phosphoric acid solution, in less than a month resulted in the cessation of the discharge and the closure of the opening into the antrum. Case II., that of a middle-aged lady, was exceptional from the fact that the normal opening of the antrum into the nose seemed permanently occluded. The previous history of the case was interesting from several failures to diagnose the disease. The patient recounted that she had suffered for some years from numerous gumboils on the left upper jaw. In January, 1888, the swelling of the upper part of the face became more serious and prominent, though relieved to some extent by the alternate treatment of poulticing and lancing resorted to by the local medical practitioner. Matters becoming worse towards the end of March she consulted a physician, who recommended her to a dental practitioner, and he on March 22nd extracted a left upper bicuspid, which was followed by profuse bleeding. On the following day there was a considerable flow of pus from this socket. As the swelling still remained considerable and a

discharge oozed from the socket, she again consulted the physician and the dentist before referred to, when they recommended the removal of the remaining two upper molars. Dissatisfied with that opinion, she consulted a London dental practitioner, who at once diagnosed that the antrum was involved, and referred her to Mr. Cunningham, without informing him, however, of his diagnosis. On the 7th May, 1888, the latter found that the general swelling extended over the roots of all the teeth between the incisor and the second bicuspid, and that the socket of the first bicuspid had healed over with the exception of a small fistula, through which a blunt probe readily passed into the antrum. On enlarging the opening there was a very considerable flow of pus. On syringing the antrum it was found impossible both at that and subsequent sittings to force the solution through the antrum into the nose. The two remaining upper molars were carious with exposed pulps, which were removed and the root canals filled at subsequent sittings. The principal dental feature of the case seemed to be the condition of the left upper lateral, which was loose, tender on percussion and the gum over the root considerably inflamed, while the pulp had all the appearance of being "dead." On drilling through the palatal surface of this tooth the pulp was found to be in a pasty degenerated condition, with no apparent putridity. On clearing out the pulp cavity it was found that the apex of the root was patent. The root canal was then filled in the usual way (May 10th, 1888). In a short time the general swelling entirely subsided. As a slight discharge continued despite careful syringing on the part of the patient, she was advised that a complete cure could not be effected without establishing a second opening into the antrum in order to obtain effective irrigation, and she was strongly advised to have the nose examined with a view to ascertaining the cause of the closure of the opening into the left nostril, but as the discharge was so slight she was unwilling to submit. On January 4th, 1889, the patient reported that the discharge still remained slight and inoffensive, but persisted that the left upper lateral must be connected with the

trouble and desired to have it extracted, which was done. On injecting through the socket of the bicuspid the solution passed out partly through the socket of the incisor and *vice versâ*. The socket of the lateral rapidly healed and the patient continued to syringe the cavity through the bicuspid socket which still remained patent, which it will probably do until the natural escape of the antral secretions can take place into the nose. The patient had not been seen for some months, but wrote the other day that she only finds it necessary to syringe the cavity occasionally, and seems quite content with her present condition, which is that of a chronic antral fistula. From an experience of the results of the accidental perforation of the antrum in the process of implantation he would conclude that the exploration of the antrum by drilling through from the mouth without removal of any of the teeth would usually be attended with no untoward results.

Mr. Hern said that as Dr. Semon had given the Society the reasons *pro* and *con* for making an alveolar opening into the antrum rather than a nasal passage, he might mention some others which were, he thought, strongly in favour of the alveolar puncture. All were aware how readily openings in mucous membranes closed up, so that in cases like those under discussion, which were very chronic taking a long time to get cured, there would be a great tendency for any puncture through the nose to close up before the antrum had thoroughly resumed its healthy condition. And again, a second advantage of the alveolar method consisted in the facilities it afforded patients to syringe themselves without the aid of special appliances. If the ostium maxillare were not completely occluded, the alveolar puncture permitted of thorough syringing through from the nose, the fluid escaping from the alveolar opening. Mr. Hern was disappointed that Dr. Semon had been unable to tell them of any plan by which the tedious period of after-treatment might be curtailed. He should also like to hear from the reader of the paper when he considered it advisable to encourage the puncture to heal up.

Mr. Maggs reported a case bearing upon the subject which had occurred in his practice about three weeks ago. The patient was a girl of twenty-three, who had lost the bicuspids and first molar on one side; she suffered great pain in the cheek, and had a purulent discharge from the nostril. There was flattening of the palate viewed from the mouth; no dead teeth except the lateral of the same side, which was removed under gas. Some blood and purulent discharge followed the extraction, and the cavity was therefore washed out with carbolic acid lotion. The case did very well.

Mr. Van der Pant related a case of a girl who was supposed, by her doctor, to have antral disease. The doctor removed a root of one of her molars, but as he used no anæsthetic, and the operation was a very painful one, the patient refused to go to him again. Upon being brought to Mr. Van der Pant he found there was a slight discharge from the left nostril, and the mouth contained a number of rotten stumps. The roots were all removed under nitrous oxide gas, but the antrum was not opened. The discharge ceased, and the general health of the patient underwent immediate amelioration. This case showed that sometimes conditions due simply to diseased roots simulated empyema of the antrum, or at least might be confounded with it.

Dr. Greville MacDonald said that although he quite agreed with most of the conclusions enunciated in Dr. Semon's admirably complete paper, there was one point upon which he felt himself compelled to differ, viz., as to the etiology of empyema of the maxillary sinus. He had himself had eighteen cases of the disease, in fifteen of which there was evidence either of existing or former intranasal disease—such evidence as would remain unquestioned by anyone conversant in the method of examining the nose. In the other three, moreover, although there was no present indication of disease, the patients had ascribed the origin of their trouble to a bad cold in the head. He was compelled to admit, however, that in one of these cases his colleague, Mr. Leonard Matheson, who had operated upon the majority

of his cases, believed there was strong evidence of the mischief having originated in the teeth. Dr. MacDonald made a few additional remarks upon the question of diagnosis, so far as it was illustrated by his own cases. The only subjective symptom of any value was pain. Most often it was referred to the cheek and described as face-ache, though in two cases it was distinctly supra-orbital and was relieved as soon as the pus was evacuated. In each of these cases the attacks of pain supervened regularly at eleven and one o'clock respectively every morning, to pass off after two or three hours, as soon as the discharge began to flow from the nose. In one of these cases the access of pain was preceded by formication and pricking over the brow; while in the other it was accompanied by severe frontal headache. In a third case general neuralgia of the side affected appeared every third day, only to be relieved when pus began to flow from the nose. When pain was not actually complained of, it could sometimes be elicited by gentle percussion over the malar or nasal bones; sometimes the patient would complain that the pain thus induced would radiate along the alveolar border towards the ear. Passing on to objective symptoms, the speaker remarked that they were sometimes extremely difficult to determine positively. Usually pus lying in the concavity of the middle turbinated body was sufficient evidence of the presence of pus in the antrum. But where, as for instance, in both the cases of supra-orbital pain mentioned above, pus was flowing also from above the middle turbinated body and observed lying between that structure and the septum, he considered it sufficient evidence of the co-existence of disease in the ethmoidal cells; and such cases in his hands had proved the most intractable. Along with pus lying in the regions indicated, there were not infrequently evidences of caries of the bone in the same neighbourhood, accompanied by enormous masses of œdematous granulations which were generally designated as mucous polypus. Dr. MacDonald considered that speaking without pathological accuracy, wherever we found nasal polypus accompanied with suppuration, it afforded the strongest evidence

of the presence of pus in the antrum. He attributed the difference of opinion as to etiology mainly to the failure in appreciating this fact; and he strongly suspected that a great number of instances were thus overlooked. In doubtful cases he held it quite justifiable to make an exploratory puncture either through the nose or alveolus for the purpose of diagnosis. For purposes of treatment he considered the alveolar opening preferable, even though it might necessitate the sacrifice of a sound tooth; though this was a matter he always left to the dentist for decision. In one case in which Dr. MacDonald had made an opening through the inferior meatus at the earnest request of the patient, very severe bleeding had occurred, a contingency likely enough when we remembered the spongy venous structure that for the most part lines the inferior meatus. Further difficulty had occurred in this case in the impossibility of keeping any sort of drainage tube *in sitû*, and ultimately it had become necessary to make an opening into the antrum in the more approved manner.

Mr. David Hepburn said that there was one point of practical import in treatment which he proposed bringing before the Society. When the alveolar opening into the antrum was made it was necessary to arrange the opening in such a way that it was readily accessible for syringing out the cavity. In the last case of antral abscess which had fallen under Mr. Hepburn's care, he had, after extracting the tooth to open up the antrum, replaced it by a vulcanite tooth; he had then drilled out the crown of this, making an infundibuliform opening into the antrum. The patient could himself by running the nozzle of his syringe along the line of the teeth easily feel the aperture and so syringe out without trouble or difficulty. Another advantage of this contrivance was that it was so easy to plug the aperture in the tooth, and by inserting a little pledget of iodised wool after washing out to maintain the cavity sweet and avoid the trickling of pus into the mouth.

The President said he might supplement Mr. England's remarks by stating that after opening the antrum in the

way described by him they usually inserted a plate with a tube attached, so that the tube entered the aperture into the antrum. There was a further point in diagnosis which was of importance and to which he might refer before calling upon Dr. Semon to reply. It had been illustrated by the first case which he had seen in consultation with Dr. Semon. The patient had no carious teeth, but had an upper molar containing a large filling as well as a palatine root well filled but absorbed, so that although from the surface there appeared no way for pus to enter the antrum, yet it could do so around the absorbed root.

Dr. Semon, in replying, said the question of how common a disease antral empyema was could not be decided either by the surgeon or the dentist, as different types of cases went to them. Thus, so long as a patent ostium maxillare existed the patients went to the dentist, but when it became closed they drifted to the surgeon. In reference to the neuralgia sometimes present in these cases, he pointed out that it was usually situated over the frontal sinuses, and pain in that situation must therefore be carefully considered before a diagnosis could be finally made. The question of opening was an important and difficult one to decide. Undoubtedly when possible it was better to do without any opening, but when one was made the alveolar one was, he thought, preferable, as that through the nose was liable to produce severe hæmorrhage. As to openings in mucous membranes healing up too quickly, there was no fear of that, for the nasal openings were very slow to heal. Referring to chronic cases, Dr. Semon advised if the simple alveolar opening failed to produce a successful result, that a counter opening should be made through the nose and syringing right through be practised. The antrum being a cavity lined by mucous membrane there was a danger of iodoform poisoning if that agent were used too freely for stuffing or syringing, and Dr. Semon therefore suggested caution in its use.

The President having put the usual vote of thanks, which were duly honoured by the Society, announced that

the next meeting would take place on Monday, December 2nd, when communications would be read by Messrs. J. Ackery and W. B. Paterson "On a Peculiar Fracture of the Superior Maxillæ;" by Mr. E. Lloyd Williams "On a Case of Sarcoma of the Upper Jaw;" by Mr. George Cunningham "On a Case of Dermoid Cyst containing Teeth showing Caries," and casual communications by Messrs. Charles Tomes, W. Hern and D. Hepburn.

The meeting then adjourned.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

December 2nd, 1889.

MR. HENRY SEWILL, M.R.C.S., L.D.S.,

PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

Mr. JOHN CHARTERS BIRCH, L.D.S.Ire., of 2, Brunswick Place, Leeds, was balloted for and elected a non-resident Member.

The LIBRARIAN (Mr. ASHLEY GIBBINGS) reported the addition to the Society's Library of Dr. George Johnson's "Essay on Asphyxia," the Transactions of the Royal Society and other journals.

Messrs. ROBBINS and C. D. DAVIS were elected Auditors.

Mr. E. LLOYD WILLIAMS reported a very interesting case of antral tumour. The title had been erroneously placed upon the agenda as "A Case of Sarcoma of the Upper Jaw," and indeed until after the operation, when the specimen could be dissected and examined, it was believed to belong to that category, whereas it had turned out to be an extremely rare growth, a myxoma involving the infra-orbital nerve, and invading the antrum and impinging on the orbital plate. The patient, a woman aged twenty-three, had suffered very severe pain extending forwards from the region of the upper bicuspids upon the right side. The neuralgic pain involved the teeth and mucous membrane supplied by the anterior dental branch of the superior maxillary division

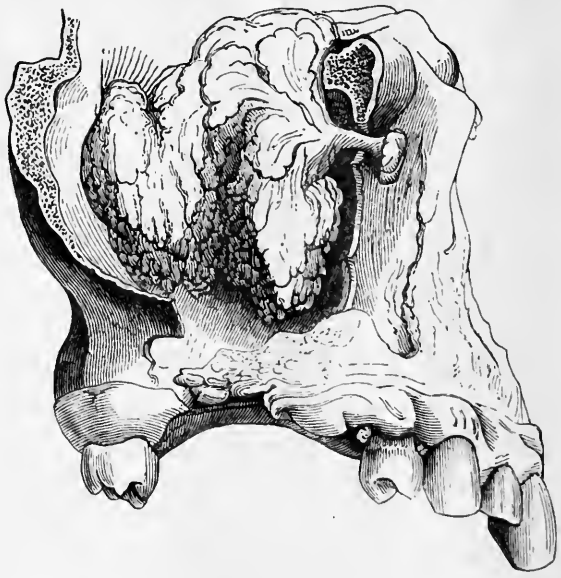
of the fifth. There was also anæsthesia of the skin supplied by the orbital branch. The neuralgia had lasted for about a year before she was seen by Mr. Lloyd Williams. As the pain was clearly not of dental origin, she was referred to Mr. Bland Sutton, who, believing that she was suffering from sarcoma of the upper jaw, removed the right superior maxilla. As Mr. Bland Sutton was present Mr. Lloyd Williams proposed to leave to him to narrate the clinical features of the case, but he would draw the attention of the members to one or two points of interest. In the first place the case showed how desirable it was not to confine the attention, in cases of severe neuralgia, to the teeth, but to seek for its cause either in the nerves themselves or in the central nervous system. It was a common complaint among dentists that medical men were too apt to neglect the dental origin of neuralgia, and this case showed how important it was for dentists not to fall into a like error and confine their attention solely to the teeth, when called upon to grapple with inveterate neuralgia. And secondly, it was of interest to see how efficiently the portions of the jaws removed in operations like the present one could be replaced by artificial plates. Mr. Schelling, a student at the Hospital, had constructed the apparatus in vulcanite, the thicker portion being hollow—a great advantage in the treatment of these cases, where much of the alveoli was removed. It would be seen by members who examined the patient, who was present for that purpose, that her speech, her mastication, and powers of eating and drinking were rendered almost normal by the contrivance which she wore.

Mr. Lloyd Williams showed also a case of syphilitic perforation of the palate. The patient, a man of about thirty, had contracted syphilis in April, 1887, and in August, 1888, perforation of the hard palate was complete as a result of syphilitic periostitis. The case was remarkable from the very short time which had elapsed between infection and the supervention of periostitis. The patient had applied at the Dental Hospital for relief on account of the serious inconvenience he suffered through the

perforation in his palate, as in smoking, eating, or drinking, smoke, food, and fluids escaped into the nasal cavities. In studying the case, the question arose whether it would be best to assist nature by means of a plate which would cover in the aperture, or whether such a contrivance would exert deleterious pressure upon the soft parts and so increase the evil. It was decided to adopt the plan of adjusting a carefully fitting obturator, and the result was very interesting, for the aperture had under the treatment contracted up, and at the present time showed only a pinhole orifice. The occluding tissue was fibrous in nature and was clearly the result of the protection afforded by the plate. Mr. Lloyd Williams laid great stress upon the importance of ensuring an accurate fit and so avoiding undue pressure around the margins of the aperture. The obturator had, in this case, been executed with much care by Mr. Day, a student of the Hospital, and was shown *in situ* at the meeting.

Mr. J. Bland Sutton said that he proposed to narrate briefly the clinical facts of the first case to which Mr. Lloyd Williams has referred. It was of extreme interest both from a clinical and pathological aspect. The patient complained of the most terrible neuralgia, and had had several teeth removed in the hope of gaining relief. When seen at the Middlesex Hospital it was observed that the right eye was unduly prominent, being also pushed outwards; the globe, also, was painful to pressure. Sensation was carefully tested by means of a pin, and it was found that the area supplied by the infra-orbital nerve was quite anæsthetic. The neuralgia was also worse in the gums and soft parts supplied by that nerve, while areas innervated from other parts of the fifth nerve were found normally sensitive. The neuralgia was so severe that it needed fifteen-grain doses of antipyrin to afford the smallest relief. The evidence thus afforded was deemed sufficient to warrant the diagnosis of antral tumour involving by pressure or otherwise the infra-orbital nerve. After consultation with his surgical colleagues, Mr. Bland Sutton decided to remove the upper jaw, as any measure short of that was considered

likely to prove insufficient. The patient being anæsthetised a preliminary laryngotomy was done and the pharynx plugged, a method for which in excision of the jaws Mr. Bland Sutton expressed his strong advocacy, as it removed all anxiety about blood entering the lungs. The lip being divided and the cheek reflected, a nodular growth came into view, which was seen, when the bone was partially chipped away, to involve the infra-orbital nerve, and to fill the antrum. Mr. Lawson (one of his colleagues present at the operation) urged the removal of the whole upper jaw, which was accordingly done, and Meckel's ganglion coming into view was destroyed. The eyeball was supported in its place by pads of oiled lint. After removal of the jaw the tumour was found to have no bony attachments. It was covered



A myxoma of the Infra-orbital nerve invading the Antrum.

with mucous membrane, clearly that of the antrum, and in structure was found to be a myxoma which had sprung from the inter-tubular structure of the infra-orbital nerve expanding the nervous tissue over it. A careful research had proved it to be an exceptionally rare tumour. Virchow had mentioned it, stating that when a myxoma grew from the inter-tubular structure of a nerve, it developed quite in

the way which had occurred in the case in point, and further stated that when these tumours found their way into cavities they became lobulated as a result of anatomical environment. Mr. Bland Sutton pointed out that the fifth pair of nerves were prone to neuromata, but as far as he knew this was the only recorded case in which a myxoma or neuroma had grown into the antrum. He could not help believing that the cases which must have occurred previously had been overlooked, the growth having been hastily dealt with as a specimen of tumour of the upper jaw, and its precise anatomical relations not fully dissected out.

The PRESIDENT remarked that the two cases brought forward by Mr. Lloyd Williams were of remarkable interest, and he thought the best plan would be for the discussion to be taken separately upon each specimen. As several hospital surgeons were present he hoped they would be able to initiate a good discussion.

Mr. STORER BENNETT said in connection with the first case, which Mr. Bland Sutton had very graphically described, he remembered a case which came to the Middlesex Hospital while he was a dresser to Mr. Henry Morris. It was that of a man at the other end of life, for while Mr. Sutton's patient was twenty-three the one of whom he spoke was over seventy years of age. He had for three or four years suffered intense neuralgia on the right side of the face affecting the eye and the cheek. For the treatment of this he had all the teeth of the upper jaw removed one after the other, with only temporary relief. It then became very evident that there was something deeper than a mere distal cause of the trouble. Mr. Henry Morris, after keeping the man under observation for a time, decided to stretch or remove the infra-orbital nerve, dragging as much of the nerve out of its canal as he could. When the nerve was exposed a number of small tubercular-looking tumours could be seen on the nerve itself, springing from the neurilemma, and these pressing down on the hard bony canal had caused intolerable pain.

Of course in using the term tubercular he did not employ it in its pathological significance. After removing the nerve as far as it was possible to reach it no pain recurred. Unlike Mr. Sutton's case the tumour did not grow into the antrum, and in that respect there was a very great difference between them.

The PRESIDENT asked why Mr. Sutton had performed excision of the whole of the jaw rather than enucleation of the tumour.

Mr. BLAND SUTTON said in future, with the experience of this case before him, he should not hesitate to enucleate rather than remove the whole of the jaw. Referring to Mr. Lloyd Williams' case, he said it was not until dissecting out the tumour afterwards that he became aware of its nature. It was the first case of the kind, and having had no previous experience he thought it safest to perform the operation as he had described it, and his surgical colleagues had taken the same view.

The PRESIDENT: With regard to the second case, viz., the mechanical treatment of perforation of the palate caused by syphilis, he had always made a point of not interfering with a syphilitic sore while active ulceration was going on, as he had more than once seen mischief follow premature use of an obturator in these cases.

Mr. F. NEWLAND-PEDLEY said the experience at Guy's Hospital was not quite in accord with that of the President. They were in the habit at Guy's, as a matter of routine, of applying an obturator in all cases of perforation of the palate. The obturator was regarded by him as a splint, and it acted by preventing food, &c., from passing over the ulcerated surfaces and so increasing the mischief. He should apply an obturator whenever necrosis of bone with exfoliation occurred in the palate whether as the result of syphilis, or traumatism as from attempts at suicide. In response to a question from Mr. Hunt, Mr. Newland-Pedley said he believed that, provided there was actual perforation

of the palate, it was best to adapt an obturator, even although ulceration of the soft parts were present, but that when more bone was yet to come away he should hold his hand.

Mr. Hunt (Yeovil) was struck by Mr. Newland-Pedley's remarks; they were at variance with all the teaching which he (Mr. Hunt) had had, and suggested a line of treatment which he thought must be opposed to the practice, not only of himself, but of others. Mr. Newland-Pedley enjoyed a wide experience at Guy's Hospital, and, no doubt, had greater opportunities of observing than fell to the lot of many. Mr. Hunt hoped to hear the experience of others.

The President remarked that although he did not now see many cases of perforation of the palate, he had, while he was attached to a hospital, seen many, and his experience had led him to believe that the individual cases varied so much that it was impossible to generalise, but he had certainly followed the plan to which he had before referred, namely, he had waited for active ulceration to cease before applying an obturator.

Mr. Newland-Pedley felt that an important point to remember in the discussion was that not only did individual cases differ, but that the same was even more true of obturators. He fully admitted that obturators so constructed as to go into the perforation in the palate were most injurious, but he did not consider that one which simply acted as a splint and bridged over a cleft without unduly pressing upon the edges could possibly do harm, even when ulceration had not ceased.

Mr. Lloyd Williams, in replying, expressed his agreement with Mr. Newland-Pedley's views; he regarded an obturator as a splint, and thought that by its early application, as in the case cited, the patient was benefited, and the process of healing was assisted. In active ulceration, however, he should refrain from using an obturator.

Mr. David Hepburn then gave a communication, describing a Slide Section Tray:

He said anything relating to the subject of "impression taking" must always be surrounded with a certain amount of interest from the acknowledged importance of obtaining an accurate representation of the mouth as a first step towards the satisfactory application of any artificial appliance. He had therefore ventured to trespass upon their time for a few minutes that evening in order to bring before their notice a small novelty in the form of an impression tray, which he had lately devised, and a few specimens of which had been made by Messrs. Ash and Sons from his patterns.

He had called it "the Slide Section Tray," as this title in a measure explained its form and purport. Its object is to lessen the difficulties of plaster impression-taking and to avoid the evils of "dragging" where a plastic modelling material is employed. It consists of two parts, one (Fig. I.) being very similar (with certain necessary modifications) to an ordinary impression tray, only having the anterior portion of the external rim absent. The second part (Fig. II.) consists of a slide to which is attached, so to speak, the missing portion of the external rim. This slide works upon the handle, and when pushed into place completes the tray.

In order to explain the use of this instrument he described its application in one typical case, that of an upper jaw with the six front teeth alone standing, these being narrow at their necks, perhaps slightly loose and abnormally projecting. In such a case with the ordinary tray a plaster impression would be dangerous if possible to procure: a plastic one would inevitably "drag" by the resistance of the front teeth, and in so doing would probably yield a faulty representation of the palatal region, while of necessity the anterior surfaces of the front teeth would be entirely sacrificed. The "Slide Section Tray," he thought, might tend to overcome these difficulties.

Firstly, in order to take an impression in modelling composition: remove the slide, and having filled the tray with the composition place it in the mouth. Bring it well up to the backs of the teeth and hold it in position until the composition hardens. This may be hastened by syringing

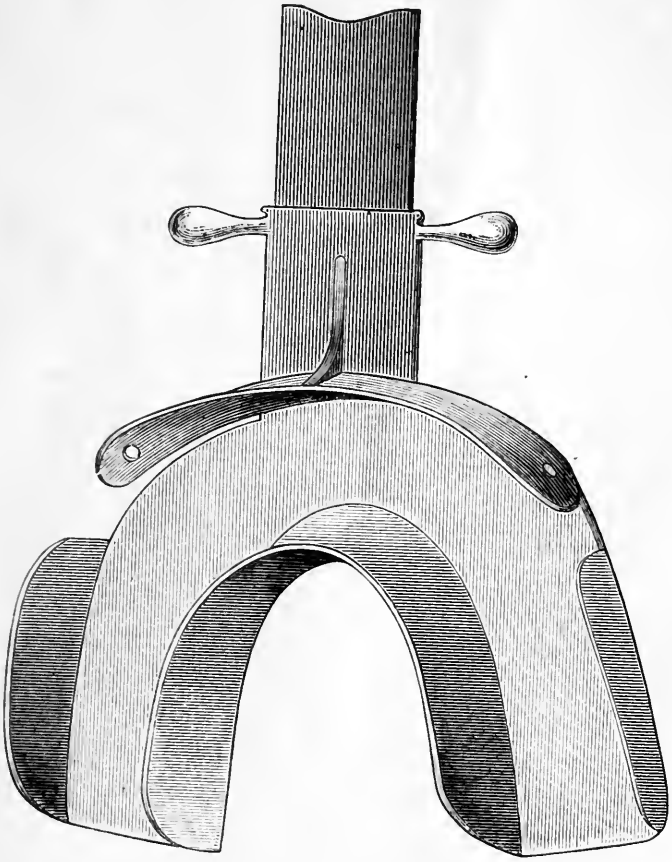


Fig. I. Slide Section Tray.

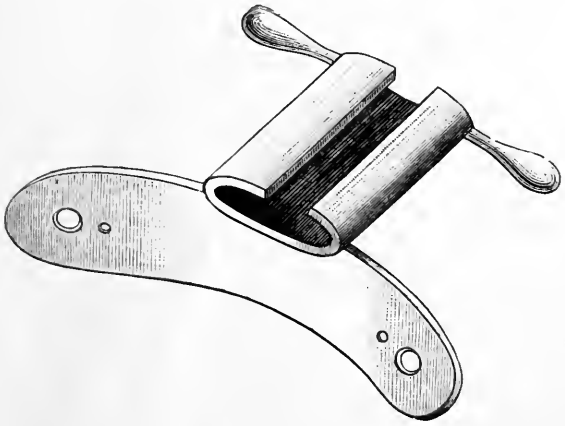


Fig. II. The Slide.

with cold water or by applying a wet napkin. The anterior surfaces of the teeth are thus left exposed. Next, having a small roll of composition ready softened, place this on the exposed surfaces of the teeth, apply the slide and press it home, this will force the roll into all inequalities and complete the impression. In order to remove the impression, partially withdraw the slide by means of the finger rests provided for the purpose. The anterior section will be found adherent to the slide. This relieves the greatest points of resistance, and the posterior section may then easily be detached from its position and the whole removed from the mouth. It only remains to bring the two sections once more in contact and the impression is ready for casting.

Secondly, in order to obtain a plaster impression of a similar case, proceed in the same way for the first half of the operation, of course substituting plaster for composition. If the plaster should curl round the anterior surfaces of the teeth pare it off when sufficiently hardened; then apply the roll of composition and slide as before described. Thus we have an easily-removable impression in plaster of the important parts, namely the palate and lingual surfaces of the teeth, while their anterior surfaces are sufficiently well taken in composition. This described in a few words the use and action of the "Slide Section Tray." A little practice of course is necessary for its successful employment, but he thought its possibilities were sufficient to warrant its introduction to the notice of brother practitioners.

It is useful in bar lower cases when the bicuspids incline inwards or the incisors project. It will also simplify modelling in cases of marked erosion, and may be employed in cases of irregularity and cleft palate with advantage.

Mr. HEPBURN briefly referred to diagrams in order to explain more particularly some points in the construction and use of the tray, and then offered for inspection some characteristic specimens of models taken by its aid.

The PRESIDENT remarked that the subject of mechanical dentistry, although not often brought before the Society,

was always of interest, and the very practical commmunication with which Mr. Hepburn had favoured them was one of no mean importance.

Mr. Van der Pant (Kingston-on-Thames) complimented Mr. Hepburn upon the ingenuity of the "Slide Section Tray" which he had devised. He (Mr. Van der Pant) had been in the habit of treating the class of cases to which Mr. Hepburn had referred by cutting off the anterior part of the usual tray, and after oiling, or still better vaselining the anterior surface of the teeth, applying some stent composition to obviate suction, and this plan he had found to answer very well. In the cases in which there was a long upper lip he thought Mr. Hepburn would find a difficulty and a great liability to failure.

Mr. Hunt considered Mr. Hepburn's suggestion a most useful one; for himself he had used plaster almost exclusively for more than twenty years, and those who had had practice with plaster could do all with it suggested by Mr. Hepburn, but without the special arrangement advocated by him. Mr. Hunt, while acknowledging the value of stent for taking *easy* models, considered it perfectly impossible to take an accurate model in stent where there were undercuts or long loose teeth, &c., and strongly counselled members who did not use plaster to try it. Practitioners accustomed to model for cleft palate must become skilled in the use of plaster, and with proper proportions of salt added, its rate of setting could be regulated almost to seconds. He then proceeded to explain, by means of a rough diagram on the black board, a method of using plaster with ease in cases of very pronounced undercut, &c. A piece of well-softened stent, say the size of a pea, was carefully moulded into any undercut, or beneath any overhanging teeth, the operator's fingers being slightly smeared with vaseline, and these stent cores could be so moulded as to retain their positions whilst a tray properly filled with plaster was introduced. The tray on withdrawal would bring out these stent cores, or if any remained they

could be lifted with fine forceps, and placed in true position in the female cast, into which plaster was then cast in the usual manner, and when the male cast was separated a perfect model with all the undercuts accurately rendered would be the result.

Mr. F. J. Bennett asked how the tray would answer in the case of a bar lower when the inner surface inclined inwards. He thought a model of the front surface of the teeth was not needed so much as the back.

Mr. Hepburn, replying, said the matter was so simple and so easily understood in practice that he did not think much discussion was necessary. With reference to the point raised in cases of long lip, that was a little difficulty, but the stent hardened so completely that in withdrawing the tray the lip yields and the stent passes over it. With regard to Mr. Hunt's remarks, he was to be congratulated that he could combat all difficulties by confining himself to plaster as a material for taking models, but he (Mr. Hepburn) confessed he sometimes had cases in which he thought his tray would be of assistance.

Mr. George Cunningham showed a root trimmer invented by Dr. B. J. Bing, of Paris. The instrument is shaped something like a pair of separating forceps, one beak of which has a bur at the end capable of being lengthened or shortened by manipulation of a button attached to the handle and controlled by means of a spiral spring. By pressing this bur into the cavity of the root canal a good fulcrum is obtained for the rotatory manipulation of the knife blade, which is attached to the other limb of the forceps. The root can thus be trimmed without altering its natural contour unless it is especially desired to do so. It is not always necessary to trim the entire circumference of the root, and this instrument may be used to remove just the particular portion desired to bevel the edge of the root to any desired degree. Although it is not universally applicable he testified to the services rendered by this instrument in crown and bridge-work.

He also presented a duplicate case of removable bridge-work adjusted to the model which illustrated the constructive details of a class of denture which he had applied with success to several cases in actual practice, and which had not hitherto been described. The upper model shewed only three teeth remaining, which were fairly sound—the second bicuspid and second molar on the right side and second bicuspid on the left—and the roots of all the anterior teeth which had been left without treatment under a partial upper denture of the ordinary kind for over fourteen years. All these roots were treated and filled to prevent further decay, but the bridge was only supported on the three strongest roots. The supporting roots were completely protected by gold ferrule caps with closed central tubes, which were fixed with thin phosphate cement. This arrangement avoided the necessity of any bar or other appliance which might interfere with the teeth being kept thoroughly clean. The bridge consisted of a metal framework to which the teeth were attached by vulcanite, and is maintained in position by three parallel split pins fitting into the tube roots, and a metal cap covering the intervening bicuspid on the left side. The patient is able to remove and replace the bridge with the greatest facility, so that thorough cleanliness is fully maintained, while the stability of the denture when in position is perfectly satisfactory. An endeavour to apply a similar bridge by means of a combination of platinum Büttner's caps and all porcelain bridge-work had resulted in failure from the contraction of the porcelain, despite the use of a strong platinum frame.

He also presented specimens illustrating a new form of crown for incisors or canines invented by Dr. Sachs of Breslau. By this method almost the entire exposed surface of the root was protected by a cohesive gold filling, which also served to retain a corrugated closed platinum tube. This tube was further anchored by means of a small projecting flange, which fitted into a small fissure made on the side of the main canal. The dowel longitudinally corrugated to correspond with the fixed tube prevented rotation, without that sacrifice of the dentine necessary for the

adjustment of a square or oval dowel of adequate strength. The crown consisted of an ordinary plate tooth backed with gold and soldered to the dowel, but without being contoured up to the usual shape of the crown, the object being to reduce the extent of contact with the root to a minimum amount. These crowns might be fixed either with mastic varnish or thin oxychloride of zinc. This method of crowning, though somewhat difficult and troublesome to make, presents many advantages over other methods.

He also took the opportunity of shewing specimens of a method of crowning which he had already described before the Society in the course of discussion of other methods. It consists of a hollow gold ferrule either with or without a porcelain face adapted to it by means of an ordinary backed plate tooth soldered to the ferrule, and a How's screw as a dowel in the root, the ferrule and the dowel being cemented together by means of an amalgam packed through the opening in the crown. This method is peculiarly suited to bicuspids and molars, it is also applicable to certain cases of the anterior teeth where the bite is not unusually close. The advantages he claimed were: 1st, a possibility of certainty as to the accurate adaptation of the ferrule to the neck of the tooth; 2nd, the stability of the screw dowel; 3rd, the use of a copper amalgam on the face of the root for its tooth-saving quality; and 4th, the completion of the crown contour, and its exact adjustment to the articulation of the occluding teeth by a contour amalgam conspicuous for its edge strength. An experience of this method extending over several years enabled him to recommend it with complete confidence.

On behalf of Dr. Herbst of Bremen, he presented the following:—

Specimens 1 to 4 showed the use of gold rings in the restoration of crowns of bicuspids, practically the gold ring forming a permanent matrix for the retention of the amalgam with which the operation was completed. In one case, where the labial side was destroyed, an artificial tooth was fitted into the place and held in position by a gold ring and amalgam.

Specimen 5 demonstrated the application of the same operation to the crowns of molars which had been entirely lost, one case being treated with amalgam and the other with cement, and the grinding surface covered with a glass filling.

Specimen 6 showed the adaptation on the same principle of a glass filling to the crown of a bicuspid.

Specimen 7 shewed two large contour gold fillings made by the Herbst method, with the first part of the filling at the cervical margin made of tin and gold.

Specimen 7B consisted of two large contour gold fillings also filled by the Herbst method, but with this peculiarity that they were filled entirely with Wolrab's gold foil and not with cylinders—the surface was finished with extra heavy gold foil (No. 60).

Specimen 8 two gold fillings in central incisors filled from the lingual surface by the Herbst method.

In explanation of the method by which Dr. Herbst manipulated gold foil in such cavities he showed specimens of two instruments which Dr. Herbst largely used: first, a straight plugger formed by fixing an ordinary steel needle in a suitable handle and breaking off a small piece with a pair of pliers each time that a new serrated surface was required; second, an inverted cone-like wheel instrument of bloodstone or agate.

Mr. J. Ackery for Mr. W. B. Paterson and himself read the notes of a "Case of Compound Fracture of the Superior Maxilla and Nasal Bones."

Fractures of the superior maxilla are so uncommon in civil practice that he thought a few notes of the present case might be of interest to the Society.

James McCarthy, æt. seventeen, newspaper boy, was struck on the left side of the face by a "swing boat," in which two persons were seated. He was rendered unconscious for about ten minutes, and was subsequently admitted into Darker Ward, at St. Bartholomew's Hospital, under the care of Mr. Morrant Baker, on March 28th, 1889.

State on admission (taken from registrar's and dresser's notes):—

"Face much bruised and swollen, large hæmatoma under and around left eye, pupils of both eyes normal, considerable chemosis in left eye, marked crepitus extending from left molar region transversely across the face and over the nose. The orbital plate of left superior maxilla apparently not implicated, the fracture being below it. There is a wound about half-an-inch long over the bridge of the nose, through which the left nasal bone protrudes, and another one and a-half inches long running transversely outwards from left nostril, at the bottom of which bare bone can be felt with the probe. Tongue lacerated in two places. There is much displacement of upper jaw, the left alveolar process and teeth being about half-an-inch lower than the right."

On the morning of 30th of March he was asked to see the case and found the face still much swollen, and the entire upper jaw displaced downwards and to the right as above described. The upper jaw could be moved *en masse* laterally, also downwards and to the right as if "hinged" about half an-inch above the alveolar border on the right side.

He decided to put the fracture up with the lower jaw as a splint, and later in the day, chloroform having been administered, he was able to reduce the displacement fairly well, but not without using considerable force, as the bones of the left side of the face seemed "stove in." On bringing up the lower jaw the teeth came into fairly good position, though the articulation was not very exact. A four-tailed bandage was applied and retained the bones well in place, but owing to the damage to the nose and the swollen condition of the tongue the patient's breathing was so seriously interfered with that it became necessary to loosen the bandage. Sickness supervened, and it was not thought advisable to attempt any further treatment at that time. On the following day, 31st inst., impressions of both jaws were taken, and the upper jaw temporarily held in position by a piece of half-inch composition gaspipe flattened so as to form a "bit," which was placed across the upper arch below the first molars, and then being turned upwards and backwards was fixed by a bandage carried over the occiput.

The models having been cast a dental alloy plate was

struck up, fitting over the palate and teeth in the upper jaw. A socket was then soldered along the upper and outer edge of the plate on either side. A stout piece of iron wire was then flattened at the end and fitted to the socket on each side and brought round well in front of the angle of the mouth, and the ends directed backwards, terminating in a hook in front of the ear. A bandage was now made fast around the hook on either side and tied below the occiput, and another bandage passed under the bars on either side was secured on the top of the head and kept the jaw in good position. This apparatus was put in on the 2nd and worn until the 5th inst., allowing free use of the lower jaw, but was then found to be causing a slight sore at the angle of the mouth on the left side, and failing to keep the parts in position, as the patient was restless at night and moved the splint as he turned on his pillow.

On the morning of the 5th inst. Mr. Paterson saw the case with him, and they agreed that a Gunning splint was necessary. As Mr. Ackery was leaving town Mr. Paterson kindly consented to take the case in hand, and the subsequent history was in his own words. Mr. Ackery added, that the credit of bringing the case to a successful issue belonged entirely to Mr. Paterson.

Mr. W. B. Paterson's notes ran as follows :—

"When I first saw the patient the swelling of the face had subsided. The soft tissues around the seat of fracture were thickened and indurated by the inflammatory exudation, and so interfered with the free movement of the upper jaw from side to side and in the upward direction previously described.

"The amount of displacement of the upper jaw towards the right is fairly accurately represented in the models sent round. The teeth, however, do not come out as well as they should, owing to being coated with the inflammatory secretions of the mouth. If the bite be disarticulated, a normal articulation of the teeth can be produced, showing that the fracture has not displaced them at all. It will be noticed that the left upper and lower lateral and canines are the only teeth which articulate. The crowns of the left

upper bicuspids and molar lie internal to and below the level of the crowns of the corresponding lower teeth, and the right upper molars and bicuspids are external to and separated from the lowers by a space of half an inch.

"With one's hands, and using considerable force to push back the upper jaw into its proper place, the displacement was only reduced to the extent that the outer cusps of the left upper bicuspids and molar could be brought to rest on the masticating surfaces of the inner cusps of the corresponding lower teeth; but directly the pressure was removed the jaw slipped back into its old position.

"No better reduction being obtainable, the prognosis for a normal bite was not favourable.

"A dental alloy plate, on the principle of Kingsley's splint, had been made by my colleague, Mr. Ackery, before I saw the patient, and as it fitted well and was strong, I removed the side wires attached to it, and utilised it in the following manner: A bite was first taken with wax on the plate as best one could; and I may say I was assisted by the house surgeon and dresser in forcing the jaw over to its right position as far as possible, and in fixing the head meanwhile whilst this was being done.

"A vulcanite box was then added to the plate on either side for the lower bicuspids and molars to bite into. In shaping these boxes a close fit with the lower teeth was not aimed at. They were lined with softened gutta-percha, and the splint thus arranged was fitted in the mouth, and the same method being pursued as when taking the bite, the lower teeth were brought to close into the boxes, and fixed there by an external apparatus.

"The external apparatus consisted of a padded metal chin-piece with side straps attached to it. These straps passed up in front of the ears and were connected with buckles sewn on a short and thick piece of strong elastic webbing, which did not stretch too easily; and these elastics were fixed to the sides of a stout and well-fitting head-cap, so that an amount of constant pressure might be kept up. A cap is more comfortable to wear, I think, than bandages or straps round the head—the pressure being more equally dis-

tributed, and with short hair and several ventilating holes, is not otherwise objectionable.

"The patient took his liquid food very well through the space provided in the front of the mouth by the propping of the bite in the molar region, and which was high enough for the purpose without causing strain and discomfort at the temporo-maxillary joint. He used antiseptic mouth washes with a syringe frequently.

"I removed the plate after it had been worn a fortnight to see what improvement of the displacement had occurred, and it was gratifying to see a very distinct amount. The plate was worn a month, and Mr. Morrant Baker being satisfied with the union of the fracture, the patient was then discharged. His bite was almost correct then. Three weeks ago Mr. Ackery and I saw the patient, and the articulation of the teeth was perfect.

"The chief point to bear in mind in the treatment of this case or any similar one, I consider, is the reduction of the displacement by means of the bite of the lower jaw, which acts as the necessary opposing force; and for this purpose some such form of Gunning's splint as that described answers extremely well."

The PRESIDENT did not quite understand where Mr. Ackery traced the line of fracture.

Mr. ACKERY: It commenced on the left side of the infra-orbital plate, passed transversely across the bridge of the nose, and ended on the opposite side, about half an inch above the alveolar border.

The PRESIDENT remarked the case was a very interesting one, and there were many Members present steeped to the fingers in knowledge of diseases of the jaws, whom they would be glad to hear upon the subject.

Mr. WM. HERN said the fracture seemed to involve both antra; he should like to ask if there were any mischief on either side. There were two points of interest, first the proved disadvantage of any splint having a bar on the out-

side of the mouth. Mr. Hern had a case at the Dental Hospital of London a few years ago, in which he at first used a Kingsley splint, but it was a constant annoyance to the patient, the arms getting in the way when the head rested on the pillow, and tended rather to delay than assist recovery. The other point was the advisability of adopting a cap, instead of bandages, to maintain the splint in position.

Mr. ACKERY, in reply, said no antral mischief existed. The cap was Mr. Paterson's idea. He might mention that the Kingsley splint was only on for three days, and in conjunction with Mr. Paterson he agreed that an internal splint should be used. Possibly Mr. Paterson's difficulty in putting in the splint about a week afterwards was due to the exudations having somewhat thickened.

After the usual votes of thanks to the readers of the "Casual Communications," the PRESIDENT announced that on January 13th, 1890, the Annual General Meeting would take place, and that the business would consist of the election of officers, the Valedictory Address, and a paper by Dr. Scanes Spicer upon "Nasal Obstruction and Mouth Breathing, as Factors in the Etiology of Disorders of the Teeth."

Odontological Society of Great Britain.

ANNUAL GENERAL MEETING.

January 13th, 1890.

MR. HENRY SEWILL, M.R.C.S., L.D.S.,
PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

The PRESIDENT announced that Mr. ALFRED COLEMAN, F.R.C.S., L.D.S., had been nominated by the Council for election as an honorary member.

Mr. Alfred Coleman had, the President reminded them, virtually retired from the profession, but during the portion of his career in which he had been connected with the Society, he had been conspicuous for his energy and loyalty to its interests. He was one of its first members who had taken the fellowship of the Royal College of Surgeons of England, and had held with ability most of the offices connected with the Society.

Mr. Alfred Coleman, F.R.C.S., L.D.S., was elected an honorary member by acclamation.

Mr. THOMAS G. READ and Mr. CHARLES WINTERBOTTOM having signed the obligation book were formally received into the Society by the President.

The TREASURER (Mr. THOMAS ARNOLD ROGERS) then presented the annual report. He stated that the financial year just completed had been more prosperous than the last, in that an increase had occurred in their income, while a decrease was existent on the year's expenditure. This

satisfactory condition, although a matter of congratulation, could not, the Treasurer feared, be regarded as permanent. Indeed, Mr. Rogers could not hold out any hope of so satisfactory a balance-sheet for coming years. The expenses arising from matters which could hardly be avoided would every year become greater in spite of the efforts of the Society's officers who had control over its various departments, and who were doing their best to keep down expenses and to enlist fresh members to assist in promoting fresh income. Dwelling upon the details of the balance-sheet, Mr. Rogers said he had endeavoured to allocate the disbursements proper to each department, so that it could more easily be estimated exactly how much expense each department entailed upon the Society.

Messrs. Harry Baldwin and W. B. Paterson were appointed Scrutineers of the ballot for the officers.

The Librarian (Mr. Ashley Gibbings) then read his report as follows:—

Mr. President and Gentlemen,—Having examined the books in the Library, I am happy to state that I find them in a satisfactory condition. A few books are missing, notably Makin's "Metallurgy," Quain's "Surgical Plates," Flower's "Diagram of the Nerves," and Stricker's "Histology;" but these have been absent for a long time. The number of books which has been borrowed during the year falls somewhat short of last year, and I cannot but think that the usefulness of the Library, as a reference Library, would be much increased if members would return the books which they borrow a little more promptly. I am led to make this remark by noticing that a number of books have been in the possession of members for several months, and I venture to remind them that the time allowed by our bye-laws is a fortnight.

Since our last meeting the following books have been added to the Library:—Tomes' "Dental Anatomy and Physiology," new edition; Sutton on "Dermoids."

I shall be glad if members will suggest the names of any books which they think should be added to the Library, and

Odontological Society. Accounts for the Year—Nov. 1, 1888—Oct. 31, 1889.

Dr.	£ s. d.	£ s. d.
To Annual Subscriptions		439 19 4
,, Arrears		65 2 0
,, Entrance Fees		32 11 0
,, Sale of Transactions	8 15 0	
,, Less Messrs. Harrison's Commission and Postage	0 16 8	
		7 18 4
,, Drew & Cadman for Breakage during Repairs		0 15 0
		£546 5 8

Cr.		£ s. d.	£ s. d.
By Rent			150 0 0
,, Fire Insurance			2 10 6
,, Meetings.	Haynes—Cushions for Benches	15 2 0	
	Curtiss—Writing Names of Presidents	1 14 6	
	Camps—Refreshments	27 8 0	
	Camps—Sundries	0 11 6	
			44 16 0
,, Library.	Churchill—Books	5 14 10	
	Hersant—Binding	2 4 6	
	Camps—Sub. Librarian	5 5 0	
	Sundries	0 6 3	
			13 10 7
,, Museum.	Mr. Storer Bennett—Specimens	12 2 0	
	Drew & Cadman—New Cases	51 13 6	
	Dr. Stack—Specimen Holders	9 19 6	
	Sundries	0 4 3	
			73 19 3
,, Transactions.	Dr. Dudley Buxton—Sub.-Editor	29 4 0	
	Messrs. Harrison—Printers	152 13 7	
	Portraits of Past Presidents	9 13 4	
	Sundries	0 7 1	
			191 18 0
,, General.	Treasurer—Petty Cash	5 0 0	
	Secretary—Postage	2 13 1	
	Camps—Gratuity	5 5 0	
	Camps—Sundries	0 17 3	
	Bank Commission on Cheques	0 4 10	
			14 0 2
			£490 14 6

ODONTOLOGICAL SOCIETY'S ACCOUNTS—*continued.*

	£	s.	d.
Balance, October 31st, 1888	378	10	4
Gross Receipts, November 1st, 1888 to October 31st, 1889	546	5	8
	£924	16	0

	£	s.	d.
Gross Expenses, November 1st, 1888, to October 31st, 1889	490	14	6
Purchase of £238 7s. 11d. 2¾ per cent. Consols.	229	9	8
Balance in Hand, October 31st, 1889	204	11	10
	£924	16	0

	£	s.	d.
Gross Receipts for the Year, November 1st, 1888, to October 31st, 1889	546	5	8
Gross Expenditure..	490	14	6
Surplus of Receipts over Expenditure	£55	11	2

INVESTMENT ACCOUNT.

	£	s.	d.
Amount in 2¾ per cent. Consols, October 31st, 1889	2561	12	1
Invested December 6th, 1888, £229 9s. 8d., producing	238	7	11
Dividends Invested, January, April, July and October, 1889—			
£77 10s. 9d. producing	78	6	4
Amount on October 31st, 1889	£2878	6	4

EXAMINED AND FOUND CORRECT, DEC. 13TH, 1889. { CORNELIUS ROBBINS, CHAS. D. DAVIS.

will enter the names in the book kept on the Library table for that purpose.

Before sitting down I wish to say that the new list of members will be published with the Transactions of this meeting, and I shall be obliged if members will at once communicate to me any errors that may occur in it for rectification; it will be arranged in a manner somewhat different to heretofore, the names of all the members being arranged alphabetically in the first part, with their addresses and qualifications, &c., and according to the town in which they practise in the second part. This arrangement will, in the opinion of the Council, be more convenient for reference.

The CURATOR (Mr. STORER BENNETT), in delivering his report, said there was little for him to add to what, from time to time, had been stated by him in describing specimens presented to the Museum. Fewer specimens had been added to the Museum, and somewhat fewer donations made to the collection than last year. It would be within the memory of the meeting that Dr. Talbot of Chicago had presented some models of dental irregularities, and Mr. Storer Bennett proposed, with the Society's permission, to describe these to the present meeting.

Mr. STORER BENNETT said that some months ago he had received, on behalf of the Society, from Dr. Talbot, of Chicago, seven cases of models illustrating types of abnormalities of the jaws of children. As doubtless members of the Society would be aware, Dr. Talbot classifies such irregularities in the following manner: (1) V-shaped, (2) saddle-shaped; whilst as sub-classes he places the remaining irregularities in two categories, viz., (i.) the modified, or half V-shaped, (ii.) the modified, or half saddle-shaped. The models in the cases were arranged in exemplification of these principles of classification. A paper by Dr. Talbot, in which he explains his views, had appeared in the *Dental Cosmos* for October, 1889. Dr. Talbot had also kindly presented to the Society's Library a *resumé* of his work, for reference by the members of the Society.

Mr. Storer Bennett further stated that a specimen had

been presented to the Museum by the President. It was a fragment of a lower jaw found in a Roman tomb in Algeria. Some undeniably Roman pottery had been found with it, so that it would appear to be authentic. Probably it was the jaw of a highly civilised individual, possibly a Roman soldier, quartered in the African colony. Examination of the jaw shewed that the left six-year-old molar had been lost some considerable time before death, and the socket was completely filled up.

The PRESIDENT then called upon Dr. SCANES SPICER to read his paper.

On Nasal Obstruction and Mouth Breathing as Factors in the Etiology of Caries of the Teeth, and in the Development of the Vaulted Palate.

By Scanes Spicer, M.D., B.Sc.

It is with very great diffidence that I, as a physician practising in laryngology and rhinology, find myself introducing for discussion at the Odontological Society of Great Britain a subject dealing especially with disorders of the teeth, for with those disorders I have no technical acquaintance; but I have been induced to bring this subject forward in the full belief that it is only by the free exchange of ideas between men practising in, and thinking on, the different branches of our profession that any real advance can be expected in our knowledge of the relations between the disorders of the different organs of the body. I feel further, that an apology is due to your Society for making this communication, while the subject is in a comparatively incomplete state, and I trust you will therefore consider the present contribution as a suggestion, or as an indication of the direction in which further extended researches are required before any final

and absolute conclusion can be arrived at. In the prosecution of these inquires I most cordially invite your criticism and assistance.

At the outset of my special practice the intimate association between carious teeth on the one hand, and diseases of the pharynx and tonsils on the other, was speedily forced upon me. It then became a matter of routine with me in every case to investigate the condition of the teeth, and to call in the aid of the dental surgeon as a preliminary step in the treatment of chronic pharyngeal and tonsillar disorders, if the teeth were acting as receptacles for decomposing *débris* and micro-organisms; this course was attended with the most satisfactory results.

As a consequence of a routine examination of the teeth, I was specially struck with two things :—Firstly, the great prevalence of caries in the teeth of patients who had nasal obstruction, and were, consequently, necessarily mouth breathers; and not only this, but the general idea was impressed on me that the amount and degree of caries bore some relation to the extent and duration of the nasal obstruction—that is to say, that patients who had been from early age the subjects of much nasal obstruction almost invariably exhibited an advanced condition of caries and loss of teeth. Secondly, the large number of my younger patients from the ages of eleven years

upwards who came to me for the well-recognised symptoms of nasal obstruction, and who had at the same time palates of a highly-vaulted character, much contraction of the dental arch, and decided irregularities of the teeth—more especially outward growing and forward direction of the canines, and slight obliquity and overlapping of the incisors of the upper jaw.

In the first place it is of course obvious that the connection between nasal obstruction and these dental and maxillary conditions may be a mere accidental coincidence; but I think you will find that sufficient reasons exist for, tentatively at all events, supporting the position that there is a genetic relation between them, and for collecting further observations on the questions.

At the outset let me say a few words as to why "nasal obstruction" and "mouth breathing" are joined together in the title of this paper, and I will do so by asking the question—how should we normally breathe? To this the answer can be given without any hesitation or qualification—*invariably through the nose.* The nose is the avenue through which all the air for the lungs should pass; and that most important functions in relation to the inspired air are performed here has been abundantly proved by the accurate thermometric and hygrometric measurements of Aschenbrandt, Kayser, Greville MacDonald,

and Blocq. Briefly summarised, these experiments have shown that almost the whole of the warming, moistening and filtering of the inspired air is done in the nose and its accessory cavities, so that the cold, dry and dust-laden air is here rendered fit for contact with the delicate mucous membrane of the larynx and lower respiratory tract. The complicated projections and recesses lined with a highly vascular and erectile mucous membrane must be regarded indeed as an elaborate mechanism to effect this purpose.

That all the higher animals, the primitive Indian tribes of America, negroes, Malays and bushmen, and practically all children at birth habitually breathe through the nose are generally recognised facts. Civilised man, only too often, at an early age (frequently with the first catarrh), commences the practice of mouth breathing.

The question naturally arises, why has civilised man taken up this habit, and to such a large extent ceased to use the organ specially suited for the purposes of preparing his respiratory food? It is because he is unable to procure, even when at rest, sufficient respiratory air for the needs of the organism through the nasal passages. Consequently he has to make habitual use of the mouth—the emergency entrance for air, which should only be used under

circumstances of special stress, as during some prolonged or arduous muscular or vocal effort. Civilised man does not get enough air through the nose because there is in him very commonly more or less obstruction of the nasal channels.

On examining the nasal fossæ with a good light, a nasal speculum and a rhinoscope, and on testing the perviousness of each side of the nose separately, we shall be surprised at first to find how widely prevalent and how various the different forms of nasal obstruction are. Some, temporary, are due to turgescence or erectile tumefaction and œdema of the vascular mucous membranes, and vary from hour to hour during the day; from day to night as the vertical position is exchanged for the horizontal, and from side to side as the patient lies on his right or left side in bed. Others again are permanent, and due to catarrhal inflammation of the mucous membrane with great thickening, and formation of polypoid flaps; to true polypi; to cartilaginous and bony outgrowths from the septum of the nose; and to bent conditions of the septum. Others again are situated back in the naso-pharynx. Among these I would especially mention the form so common in young people known as post nasal adenoid vegetations.

Are these obstructions of the nose far more

common among civilised man than among races living in a state of nature? My opinion is that they are, and it is based on the following considerations :—

(1) Careful examination of skulls in museums establishes the immensely greater proportion of deflections and other osseous irregularities in civilised Europeans than in non-civilised non-Europeans.

(2) Personal examination of several non-civilised non-Europeans (negroes, Red Indians, &c.), though only made on individuals temporarily in this country and on an insufficient scale to finally decide the point, has demonstrated that they have large, wide, patent nostrils, straight septums, and no obstruction, whereas a civilised European without some temporary or permanent obstruction I have hardly ever met.

(3) Non-civilised non-European races do not possess the physiognomical features which are characteristic of nasal obstruction among civilised Europeans—dropped jaw, open mouth, collapsed alæ nasi, &c.

(4) Mr. Catlin's observations on the primitive Indian races of America have established that they are almost universally nose breathers, and that the mothers are very careful to correct any temporary lapse into mouth breathing on the

part of their offspring. On examining the skulls of Red Indians in the Museum of the Royal College of Surgeons, the freedom from crooked septums and bony spurs was remarkable, as compared with skulls of civilised Europeans.

(5) Animals that as far as the environment go approximate to the condition of the uncivilised races of men are free from obstructions of the nose, their channels are roomy, their septa symmetrical, and they continue throughout life to breathe through the nose.

Seeing, then, that civilised man is so much more liable to nasal obstruction than his uncivilised brethren and animals, can we detect any exciting cause in his environment? My opinion is that we can, and that although the factor is a small one, it is constantly acting, and its cumulative effect in the lifetime of an individual or of a family or race is not inconsiderable. Such a cause I am inclined to see in the artificial and partial heating of our houses, and the rash way in which we expose ourselves to sudden, extreme, and frequent changes of the temperature and moisture of the air we breathe, at one moment in a hot dry room at 75°, the next in the open air at 32° F., the next in a draught, and all night perhaps sleeping in a room at 50°, after spending the day in a room at 70°. The mechanism for the warming and moistening of the air is adaptable in a certain

degree to these variations, but beyond this degree not so, and disordered states ensue. In this way the nasal mucous membrane gets in a state of inferior vitality and irritable weakness, and erects, inflames and hypertrophies without further provocation, thus producing some of the numerous forms of nasal obstruction. As the exciting causes continue to act, there is no tendency to spontaneous recovery. The secretions of the disordered mucous membrane become abnormal and irritate the lymphoid channels and follicles in the nasopharynx, and adenoid vegetations are the result.

The nose is now very blocked, little or no air can pass through it, especially if there is an exacerbation of inflammation, and should this obstruction last long during the growth of the organism, imperfect evolution of the nose will be one of the characters in the physiognomy. I do not mean to say that this is a complete explanation of all the rarities of nasal obstruction or to overlook the fact that many diathetic and specific diseases also influence the condition of the nasal mucous membrane, as well as sources of irritation from occupation, and also injuries of the bony framework.

On the other hand, in uncivilised men that dwell in freely ventilated abodes, generally not artificially warmed, or like the animals, practi-

cally in the open air, no extreme, sudden, and frequent variations in the demands made on the nasal respiratory mechanism occur. No pathological reaction therefore ensues, and the mucous membrane remains in a healthy condition, and the functions and evolution of the nose are not impaired. As there is a tendency to propagate acquired characters to the offspring, it is not difficult to conceive that whereas the Red Indian has retained a well-formed and functionally useful organ, in civilised man it is only too often stunted and obstructed.

Let us now turn from the rhinological aspect of the subject to the dental, and consider what is known as to the incidence of caries of the teeth and the occurrence of the vaulted palate in civilised and uncivilised nations, as summarised by Sir John Tomes and Mr. C. S. Tomes in their admirable "System of Dental Surgery," third edition.

I. Dr. Magitôt remarks that the Negro and Arab races are remarkable for the soundness of their teeth, the Caucasian for the contrary, and the Mongolians take a middle place. In the anthropological museums of Paris he found no example of caries amongst the crania of Mexicans, Peruvians, Patagonians, or natives of Australia, Madagascar, New Caledonia, nor among a collection of Malay and Javanese crania. Amongst

Egyptian mummies he found a good many examples; among modern nations the inhabitants of Iceland are almost exempt.

Professor Broca observes caries far less frequent among ancient populations of Europe than at present.

Mr. Mummery concludes that the frequency of caries bears a tolerably close relation to the habits of luxury of the several peoples—which luxury, I would add, at all events in temperate climates in Europe, implies the free use of artificial warmth, with its frequent sudden and rapid changes of temperature and moisture of inspired air, and hence catarrhs and at all events the commoner forms of nasal obstruction.

Sir John Tomes says (*loc. cit.*, p. 279) that among modern races the Esquimaux, North American Indians, Arabs, Africans, New Zealanders, Caffres and Northern Indians are distinguished for having sound teeth. My remark on this is that these races are as a rule those which do not live in artificially heated houses, and whose skulls are remarkable for absence of bony obstructions, and most of whom continue throughout life to use nasal respiration.

Sir John Tomes adds that there appears to be no room for doubt that increased civilisation predisposes to the occurrence of caries, though as yet it is uncertain in what way it does so.

He further says that caries is of very rare occurrence in animals, but when it does arise it is usually in domesticated beasts.

II. Turning next to the contracted jaw and vaulted palate and irregular teeth, Mummery (*Trans. Odont. Soc.* 1869), says that among savage races they are as rare, as destructive attrition is common; while precisely the contrary is true of civilised races; and this is generally agreed on by all authorities.

Comparing then, together these different phenomena, we find that, speaking generally, savage mode of life, comparative freedom from catarrh, nose breathing, straight nasal septums, good palate and jaws, regular teeth and freedom from caries are correlated conditions; whereas advance of civilisation and luxury, artificial warming of houses, tendency to catarrh, nasal obstructions, mouth breathing, vaulted palates, contracted jaw, irregularity of teeth and tendency to caries are similarly correlated.

Since, then, it is common experience that nasal obstruction and mouth breathing precede in the life history of the individual the onset of the dental and maxillary variations, it seems legitimate to inquire if the former have any influence in the production of the latter.

As far as I know, no scientific authority has published a detailed examination of the question

as to the relation between mouth breathing and disorders of the teeth; nor have I seen any reference to the matter in the large number of papers and of text books on dental surgery, to which I have referred.

Nevertheless it has been assumed by certain writers that this is the case: *e.g.*, Catlin, a very shrewd observer, though a layman, in his suggestive and thoughtful little work entitled "Shut your Mouth," refers to the saliva flooding every part of the mouth while it is shut, and carrying off the extraneous matter which would otherwise accumulate and communicate disease to the teeth and taint to the breath; he further alludes to the teeth as immersed in protecting fluid and "with powers of existing in the open air long enough for the various purposes for which they are designed, but beyond that, abuse begins and they soon turn to decay." "It is the suppression of saliva, with dryness of the mouth, and any unnatural current of cold air across the teeth and gums during the hours of sleep, that produces malformation of the teeth, toothache and tic doloureux, with premature decay, and loss of teeth so lamentably prevalent in the civilised world." "Among the brute creations that never open their mouths except for taking their food and drink, their teeth are protected from the air both day and night, and seldom decay; but with man, who

is a talking and laughing animal, exposing his teeth to the air a great portion of the day, and oftentimes during the whole of the night, the results are widely different—he is oftentimes toothless at forty. . . ."

(The native Indian races) "who talk little and sleep naturally, have no dentists nor dentifrice, nor do they require either; their teeth almost invariably rise from the gums and arrange themselves as regular as the keys of a piano; and without decay or aches preserve their soundness and enamel, and powers of mastication to old age. . . ."

I have quoted at some length from this writer of some thirty and forty years ago because he gives some facts and opinions which are well worthy of attention, although some of his expressions are erroneous and extravagant.

On referring again to Tomes' "Handbook of Dental Surgery," third edition, we are taught that we must seek for the agencies that cause dental caries among the chemical transformations that go on in the mouth. The decomposition of food has been proved to furnish acids capable of decalcifying enamel and dentine, and the buccal mucus has not rarely an acid reaction. Where there are many carious teeth the gums are usually swollen, vascular, and coated with thick stringy mucus, and that

wherever mucus, &c., is readily and speedily removed by the tongue or other agency, caries is very rare. Again, acute stomatitis occasionally exercises a most disastrous influence upon the teeth; and all conditions which tend to an unhealthy state of the buccal mucous membrane will have a deleterious influence. Dryness of the mouth from deficient secretion of saliva, and the accumulation of buccal mucus and epithelium is prejudicial to the teeth. Sir John Tomes concludes his remarks on caries as follows (*loc. cit.* p. 280): "That caries is an effect of external causes, in which so-called 'vital' forces play no part; that it is due to the solvent action of acids which have been generated by fermentation going on in the mouth, organisms having no small share in the matter; and when once the disintegrating process is established at some congenitally defective point, the accumulation of food and secretions in the cavities will intensify the mischief by furnishing fresh supplies of acid."

Mr. Henry Sewill, too, in his very interesting *brochure* on "Dental Caries," second edition, p. 70, says:—"The predisposing causes of caries are (1) innate structural defects in the teeth which render them more susceptible to the action of agents; (2) all such diseases as are accompanied by vitiation of the oral secretions, or which tend to the formation or deposit of acid,

and the accumulation of products of decomposition within the mouth; and (3) crowding and irregularity of the teeth due to smallness and mal-formation of the maxillæ. The direct agents in initiating caries are acids—principally malic, butyric and acetic; the products of chemical change and fermentation set up in fragments of organic matter (food, mucus and epithelial scales), which are commonly present in the mouth and lodged about the teeth. These acids are often assisted in their action by acid mucus secreted by unhealthy gums, acid (instead of alkaline) saliva in some diseases, and acid eructated from the stomach."

It will be readily agreed, I presume, that the condition of the teeth and gums during normal respiration, *i.e.*, through the nose with the mouth shut, is as follows: (1) they are kept at a uniform temperature, practically that of the normal body temperature, and are protected from sudden change by the thick non-conducting tissues of the lips and cheeks; (2) they are perpetually bathed in the warm alkaline salivary fluid, which wells up between them, and washes away any mucus or food tending to stagnate or decompose, as well as any micro-organisms which may have gained access to the mouth; (3) they are constantly being scoured with the alkaline saliva by the almost incessant action of the lips, cheeks and

tongue, so as to further ensure the complete removal of *débris* from their surface and interstices.

What will be the change in these physiological conditions if the subject is lying on his back with his lower jaw dropped and his mouth wide open indulging in mouth breathing, taking that as the extreme departure from physiological breathing?

(1) The teeth and gums will be exposed to a current of air at the temperature of 50°F. (supposing that to be the temperature of the unheated bedroom), after they have enjoyed during the day one of 98°·4. The result of this alternation will be sooner or later to bring about congestion and inflammation of the mouth or pharynx, leading to the increased secretion of strongly acid mucus—one of the chief predisposing causes of caries. Besides, the air being dry, must absorb moisture, and thus tend to inspissate the mucus and render it liable to stagnate and act as a nidus for micro-organisms, whose arrest is also favoured by the spongy state of the gums produced in catarrh. There can be little doubt that the sour taste in the mouth, and the thick clammy paste in the morning after a night of mouth breathing, find a reasonable explanation here; and it is very probable that the extreme variations of temperature act on the vascular supply of pulp and alveoli in such a way as to favour the production of other disorders of those structures.

(2) When the subject is lying on his back with the jaw dropped, and the tongue sunk in the mouth and fallen backwards, as is the case in mouth breathing during sleep, the mouth will generally feel parched, owing to the drying of the parts with which the inspired current comes in contact, and to the escape of the salivary fluids down the pharynx. The teeth are consequently not properly flushed, and any decomposing *débris*, charged with micro-organisms, is allowed to work its full effect wherever it can find a weak spot. The same line of argument would apply if the patient slept habitually on one or the other side; the opposite side on the hypothesis advanced might be expected to show more caries than the other. That the non-existence of a constant flow of saliva is an important factor is seen in the great tendency to caries in diseases in which there is a ptyalism, as rheumatism and diabetes.

(3) Under the same conditions the teeth are not properly scoured, for the lips, cheeks and tongue cease to be in proper apposition with the teeth, and a similar accumulation of *débris* is favoured. The importance of this factor is seen in cases in which there is extreme adynamia, as in fevers, after which teeth often rapidly decay.

(4) The abnormal stream of buccally inspired air brings into the mouth not only an excess of

fresh oxygen but it is also highly charged with micro-organisms—thus in both ways forming abnormal and excessive decomposition and putrefaction in the mouth. In this way the potency of the other adjuvants is intensified.

(5) It cannot be doubted that if mouth breathing is chronic during the period of growth and evolution of the permanent teeth, the abnormal conditions resulting from mouth breathing will have an influence on the tooth sacs and so lead to an inferior quality of enamel and dentine so rendering the teeth more prone to the exciting causes of caries later in life.

6. The vaulted palate, the contracted arch and dental irregularity are important predisposing causes of caries, as stated above; but as rather more must be said on their connection with nasal obstruction and mouth breathing, I prefer to deal with this association directly.

Let us now examine the relative incidence of caries on the different groups of teeth, as shown by the statistics of different observers, and not in any way prepared to deal with the question of the influence of mouth breathing in the distribution of caries.

From these statistics it will be seen that the six lower front teeth, incisors and canines, enjoy comparative immunity from caries. Let us consider their condition even during mouth breathing. The

lower jaw drops, and so these teeth remain covered by the thick muscular curtain of the lower lip; the salivary fluids continue to flush away *débris* and micro-organisms from their surface. These teeth are, further, not removed from the scouring action of the lower lip and tongue, and moreover are not naturally so fitted and calculated to retain particles as are those further back.

Turning, then, to the six upper front teeth, we find that they are far more liable to caries than the corresponding lower teeth. According to Dr. Hitchcock's tables the proportion is 12 to 1, and according to Magitôt's tables, 14 to 1. Considering that as far as shape and use go these teeth do not appreciably differ from the lowers, we naturally ask under what external circumstances of their existence do they differ. If we breathe through our noses, there is no appreciable difference; for the tongue, lips and cheeks are in constant apposition, and are constantly scouring both alike with the warm alkaline saliva. In great contradistinction to this is the condition during mouth breathing; it is difficult to see in a patient with an habitually open mouth, and lying on the back, how the salivary fluids are to reach these teeth unless the ordinary laws of fluid distribution are suspended, for the saliva must dribble down the pharynx as it is formed. The same argument applies when the mouth breather sleeps

habitually on one or the other side, only the uppermost side then is likely to be most affected by the mouth breathing. These teeth stand out high and dry in the inspired current in cases in which there has been long-standing obstruction from an early age; the upper lip is everted and drawn up, and the tongue is quite far away from them in the floor of the mouth. Such teeth soon become covered with a sticky paste in which micro-organisms are easily arrested, their tissues get invaded, and they succumb to caries in a far greater degree than their fellows of the lower jaw, as might be expected on the hypothesis advanced. It should be remembered that this mouth breathing, in some persons, continues day and night for almost the whole of life.

Considering, for convenience of discussion, the molars proper next, I would support the view that we have here to deal with the teeth which are most used and abused, and which are therefore most liable to accidental destruction of enamel prisms, so permitting the invasion of the dentine by the micro-organisms of caries. Further, the surfaces of these teeth are more pitted and irregular than any of the others, and are therefore more calculated to retain in these pits *débris* and micro-organisms. When to these predisposing causes of caries we have added that these teeth are equally liable to the ill effects of

the derangements due to mouth breathing, there will be no surprise that the molars are the most frequently attacked of all the teeth.

That the upper molars are less attacked than the lower may possibly be due to the fact that the upper only are flushed by the parotid secretions during mouth breathing.

For the very great liability of the first molar, I can only suggest that it is possibly the most used tooth, and, therefore, the most liable to injury of the enamel.

In the bicuspids we have teeth that are more used than the incisors, and therefore more liable to injury than they. The bicuspids are also more adapted to collect *débris* in their irregularities. The upper bicuspids are more affected by derangements of the flushing and scouring arrangements of the mouth than the lower, and therefore on the hypothesis advanced should exhibit a greater tendency to caries than they; for the latter being situated in a hollow of the chin are generally more or less flushed by the saliva, even in mouth breathing.

This does not apply to the lower molars, for they lie at a higher level, owing to the direction of the jaw. I would interpret these statistics generally by the proposition that whereas mouth breathing not improbably influences deleteriously all the teeth alike, excepting the lower central

6—10 teeth, it is possible that the factor of functional activity and accidental injury to teeth of inferior quality obscures the share taken by mouth breathing in the case of those teeth which are most used.

In connection with these remarks it would be very interesting to know if the relative incidence of caries in nose-breathing nations does or does not agree with Drs. Hitchcock's and Magitôt's well-known statistics; also if animals show a tendency to have disease of the most used teeth; also if caries, when it attacks the upper molars, prefers the labial or lingual aspect. I should be glad of information on these points, as they would afford tests of some of the points I have raised.

The onset of caries agrees with that of nasal obstruction, in that if both have not occurred before the age of twenty-five, the subject is likely to remain free under ordinary circumstances; hereditary influence, which is well marked in caries, is likewise well marked in affections of the rhino-pharyngeal tract.

There are many of the points in connection with the incidence and distribution of caries of which mouth-breathing appears to offer no explanation, *e. g.*, why females are more attacked than males.

It remains for me to consider the vaulted palate, contracted arch, and irregularities of the

teeth in relation to chronic nasal obstruction and mouth breathing.

The frequency of the association of post-nasal adenoid vegetations (thickening of the pharyngeal tonsil)—the chief form of nasal obstruction in early life—and abnormalities of the teeth and superior maxilla, was first insisted on by David (*Revue Mensuelle de Laryngologie*, 1883, quoted by Sir Morell Mackenzie, "Diseases of Throat and Nose," vol. ii.). He asserts that these vegetations reveal themselves externally by a modification of the physiognomy, which consists essentially in a deformity of the upper jaw, with projection of the incisor teeth and narrowing of the palatine arch. He holds that the patient, being only able to breathe through the mouth in such cases, the palate, still in course of development and comparatively soft, is subjected to constant pressure on its buccal surface, and thereby pushed unduly upwards.

Sir John Tomes has observed the association of V-shaped maxilla with enlarged tonsils and buccal respiration; which are, as a matter of fact, two of the chief appearances found in nasal obstruction in young people. He attributes the narrowing of the dental arch to undue pressure of the buccinator.

Dr. Greville MacDonald ("The Forms of Nasal Obstruction," p. 63) has observed that, in a large

number of patients suffering from these vegetations, the hard palate is highly arched and narrowed anteriorly, and that this condition we may find in adults where little else remains to tell of former obstruction.

In hospital, but especially in private, practice, I have been forcibly struck by the large proportion of children with nasal obstruction from adenoid vegetations, who have at the same time mouth breathing, highly vaulted palate, contracted dental arch, outgrowing, anteriorly projecting canine teeth, and minor displacements and overlapping of the incisors of the upper jaw, and have necessarily been led to reflect on the connection between them.

I regret that, although I have notes of most of these cases, I have not had casts and measurements taken before and after treatment of the nasal obstruction. The youngest child in whom I have a record of this association of abnormalities, was eleven; but I suspect that is because the canines erupt about that age, and when in the abnormal position attract one's notice to a thorough examination and record of the whole case. I should suspect that the other abnormalities of palate and teeth are frequently overlooked by the rhinologist, and would be found at a much earlier age if looked for.

The hypothesis which I would offer to the

Society was suggested by the well-known observations of John Hilton ("Developmental and Functional Relations of Certain Portions of the Cranium," 1855), as to the part played by the vomer and the sphenoidal sinuses in the formation and position of the hard palate.

My hypothesis is, that disuse of the nose during growth of the organism will lead to imperfect evolution and expansion of the nasal framework owing to the physiological stimulus of functional activity being in abeyance. In this stunting all the parts of the nose and its accessory cavities will presumably share. This is supported by the sunken, depressed, collapsed, ill-developed condition of the noses of children who ceased to be nose breathers soon after birth from the supervention of some form of obstruction. From this stunted growth there is no reason to believe that the sphenoidal sinuses and the vomer, as well as the rest of the septum nasi, will escape. The consequence is that these structures tend to retain an infantile position and dimensions; while the alveoli of the superior maxillæ, and the permanent teeth being subjected to the physiological stimulation of functional activity, rapidly evolve and increase in size. The expression of the stunting of growth of the vomer and septum of the nose and the sinuses is seen along its line of union with the hard palate, which is more or less

fixed centrally, while the alveoli continue to grow and increase downwards.

The same nasal obstruction which causes disuse of the nose also compels the subject to adopt mouth breathing. The jaw drops and hangs by the tissues of the cheek from the upper maxilla. The cheek tissues act as ligaments, and pressure is made on the growing alveoli of the upper maxillæ. This causes flattening of the lateral alveolar arches, and shortening of them; the consequence being that sufficient room does not exist for the eruption of the canines when they are due, and they grow forwards. This, divested of detail, is the theory which I would submit, and which seems to me to harmonise with ascertained facts and received opinions.

As evidence in support of it are the observations of Mr. Mummery (*Odontol. Soc. Trans.*), who has shown the great freedom of savages and uncivilised people from these abnormalities of maxillæ and teeth. Now these are the people, as I have before stated, who enjoy relative immunity from nasal obstruction; whose respiratory nasal functions are active throughout growth; and who are characterised by a well-formed and symmetrical nasal framework as well as normal palates and sound regular teeth.

The theory is further supported by the obser-

vations that removal of the adenoid vegetations, and otherwise clearing up the nasal obstruction in children at the time of evolution of the hard palate and teeth materially assists dental treatment in rectifying the condition of the upper jaw, though of course the cases that are brought to the rhinologist are brought for other reasons, such as snoring, mouth-breathing, deafness or enlarged tonsils, &c., &c., and not for their jaws or teeth, which, in all my cases, have been under the charge of a dental surgeon concurrently.

I cannot agree with David's theory that increased pressure of inspired air during growth pushes the hard palate up, for if that were the case we should not have the median line the highest point, for it is supported by the septum nasi, and if his views are right, we should expect a vaulting on each side of the median line; further, the atmospheric pressure in the mouth, even during inspiration, cannot differ materially from that in the nose.

Just a few words on the insidious nature of mouth breathing in many cases. There are many persons who strenuously deny the habit; and when their attention is called to it find they can breathe through their noses for a few seconds or minutes; yet in the ordinary way, for the greater part of the day and the whole of the night, these breathe through their mouths. This

partial nasal obstruction is almost always liable to aggravation by periodic turgescence of the mucous membrane, and by gravitation of fluid into the most dependent part of the turbinated bodies, which in the recumbent position on the back is at their posterior extremities.

It is not, therefore, sufficient to be assured by the patient that he always breathes through the nose, or even that he does so through each side separately when tested; it is far more important to enquire for or look for some of the more common results of nasal obstruction, and to examine the nasal cavities. Among the signs on which most reliance can be placed are: (1) open mouth, dropped jaw, and vacant expression of countenance in children; (2) dry mouth and parched throat during night and in morning; (3) clammy sour taste in mouth on waking; (4) snoring and heavy breathing during sleep; (5) chronic sore throat and other uncomfortable sensations in pharynx; (6) enlarged tonsils with enlarged glands in neck; (7) thick tenacious mucus clogging the naso-pharynx, pharynx and larynx, before breakfast; (8) night terrors in children; (9) earache, deafness and otorrhœa are exceedingly common consequences of neglected nasal obstruction, especially adenoid vegetations from catarrhal processes extending to the middle ear.

In conclusion, I would recapitulate as follows:

I. The pernicious and widely prevalent habit of mouth breathing—the necessary consequence of nasal obstruction—appears to have some influence in intensifying many of the proximate factors at work in the production of caries of the teeth—(1) by increasing the stream of micro-organisms and of oxygen in the inspiratory air current; (2) by producing congested and inflammatory states of the buccal mucous membrane, with increased secretion of highly acid mucus; (3) by desiccating the secretions of the mouth and so favouring their adherence, together with organic *débris*, to the pits and irregularities of the teeth; (4) by the alteration of the positions of the lips, cheeks and tongue in relation to the teeth, so that the latter cease to be constantly scoured with saliva by the incessant action of the former; (5) by the substitution of a cold air bath during mouth breathing, for the warm bath of saliva, which incessantly floods the mouth when it is shut, and flushes away any *débris* and micro-organisms that may have collected.

II. The highly arched or vaulted palate, the contracted alveolar arch, and certain irregularities of the teeth of the upper maxilla are very frequently associated with chronic nasal obstruction in young persons. This association admits of a rational explanation on the hypothesis that

prolonged disuse of the nasal channels for their natural functions during the growth of the organisms leads to stunted evolution of the nasal framework. The septum and sphenoidal sinuses partake in this, and fail to push down the palatine processes of the maxillæ, while the rest of the face, including the freely-used alveoli, continue to grow. The median line of the hard palate along the attachment of the vomer tends to retain its infantile position. The weight of the lower jaw—which drops to allow of mouth-breathing—acts through the tissues of the cheeks and presses on the superior maxillary alveoli, flattening each curved lateral half, so as to diminish the space available for the eruption of the canines and other teeth, which therefore are compelled to assume irregular positions.

Should further investigation cofinrm the accuracy of the view that nasal obstruction and mouth breathing act in the manner suggested in the production of the dental and palatine conditions that have been referred to, it is obvious that the restoration of the breathing channels through the nose, and the cure of mouth breathing should be carried out by the rhinologist *pari passu* with the treatment of the teeth and palate at the hands of the dental surgeon.

Discussion.

The President said Dr. Scanes Spicer had placed clearly before them facts and hypotheses of great interest. He had been glad Dr. Spicer had insisted, as he had done, upon the fact that the origin of caries must be looked for in extraneous circumstances rather than internal structural processes. He, the President, could not express in sufficiently strong terms that the origin of caries lay in processes entirely due to external agencies, while the tissues constituting the teeth were absolutely passive, and in this view all must agree who had any pretensions to a knowledge of dental pathology. Enamel, when once fully formed, could not by any conceivable process undergo any change, since no physiological agencies existed in enamel whereby changes could be brought about. It was a matter of extreme regret that so much that was erroneous, and so much that was unreliable, had been written and published on the origin of caries. One individual had gone so far as to say that micro-organisms were really nothing more than inflammatory corpuscles—a statement which could only prove how absolutely ignorant its propounder was alike of the science of bacteriology and that of microscopy. Many had observed the coincidence of mouth breathing with a modification of the form of the jaws, and the subject was one of great interest, and would, he trusted, elicit a good discussion.

Mr. Robert Hall Woodhouse said that they must have all listened with interest to the paper, but he felt he for one could hardly accept all the conclusions laid down in it without further proof; for example, he could not help thinking too much stress had been laid by the reader of the paper upon the fact that in mouth breathers, the temperature of the teeth and gums were liable to considerable vicissitudes. As a matter of fact, he thought that the extremely full and free circulation of blood, both through the teeth, the gums, and the buccal structures, effectually counterbalanced the

effect of mouth breathing, and would maintain a fairly equable temperature. And again, if Dr. Scanes Spicer's contention were just, an anomaly existed, for the exposed surfaces of the teeth, viz., their lingual aspect should become carious first, which, however, was not the case. There was another matter upon which he might touch, viz., with regard to the shape of the jaws. While admitting that mouth breathing might in some cases produce modification in the shape of the jaws, he believed a more important factor was to be found in the individual physique; thus it was easy upon looking at any given person to say whether or no the arch were contracted, for example powerfully built, broad, muscular men did not reveal a narrow dental arch. At one time he had devoted a considerable amount of time and study to the consideration of the maternal dental arch as affecting childbirth, as he was sure that in parturition the presence or absence of a wide maternal jaw made all the difference between an easy and a difficult delivery. Of course that subject could not be pursued further in that Society, but he was assured of its great importance, and it was of interest in the present connection in that a wide or narrow arch at birth could have nothing to do with vicious methods of breathing, but must be a distinctly racial trait. Another point he should like to touch upon, was with reference to the carious condition of teeth in civilised peoples, who were said to be mouth breathers, in contrast to the healthy teeth of uncivilised races. He believed the apparent immunity from caries which the latter appeared to enjoy might be explained by their general better state of health, and more perfect physical development. An examination of the teeth of uncivilised peoples showed them to be, in proportion to their size, more widely separated, more massive and rounded than was the case in civilised people.

Mr. Henri Weiss believed that the presence or absence of oxygen was an important factor in the production of caries; whatever influences an increased current of impure micro-organism-laden air impinging upon moist teeth would predispose to the production of caries.

Mr. Storer Bennett said that Dr. Scanes Spicer had mentioned that the lower animals were nose breathers and free from dental caries. This, however, was certainly not the case in certain animals, for example, the wolf and dog, which were habitually breathing through the mouth, and were yet, except under the deleterious influences of domestication, singularly free from dental caries.

Mr. Huxley (Birmingham) said that the same idea had occurred to him, but he thought that the apparent contradiction might be reconciled. In dogs there was very profuse secretion of saliva, so that the teeth would be constantly kept flushed by that fluid, and this, coupled with the extremely active tongue, would probably counterbalance the evil effects of the constant opening of the mouth.

Dr. William Hill thought that too much importance had been attached to the changes-of-temperature theory of the disease of teeth. He had always himself been inclined to lay greater stress on the agency buccal secretions had in determining dental caries. If the atmospheric air were, allowed to pass through the mouth instead of the nose, the mucous membrane lining that cavity would become unhealthy, and its secretion acid, and owing to evaporation thick and viscid, its specific gravity being distinctly higher. These changes were competent to produce caries, and were, he submitted, more likely to do so than would mere vicissitudes in temperature. With regard to the shape of the arch and high vaulted palates, he believed that family and racial peculiarities largely accounted for these. He had some years ago very carefully examined a number of idiot children in Earlswood Asylum, and had found that the V-shaped maxilla was a common type among idiots.

Mr. George Cunningham thought that the paper and the discussion had brought them face to face with the fact that they were up to the present time in possession of little knowledge of the clinical aspects of dental caries. He had been very anxious to establish collective investigation upon dental diseases in children, and he hoped before long to be able to give the results of these as regards the children in State schools, &c. He thought that, with regard to caries,

the British Dental Association might very well undertake to investigate the question—How far is mouth breathing in children productive of dental caries? He hoped that in the future, when our knowledge of the chemistry of the secretions should become more exact, that they would be able to speak in a more authoritative manner upon the subject of how far vitiation of buccal secretions was pathognomonic of dental caries.

Dr. Scanes Spicer having briefly replied, the President delivered his valedictory address:—

Valedictory Address.

Mr. Sewill said the time had come when it became his duty to pass on his office to his successor, and in doing so it was necessary for him to decide whether he should, in deference to custom, deliver a valedictory address or maintain silence. The time might come when the custom of giving such addresses would be more honoured in the breach than in the observance. One of the most distinguished occupants of that chair had set the example of retiring in silence, but he, Mr. Sewill, felt were he to copy that example, his so doing might be misinterpreted. All things considered, he had decided to devote a short time to taking stock of the year's proceedings, that he might, at all events, "point a moral," even though he should not "adorn a tale." The reports which they had heard that evening showed that the Society was in a flourishing condition, that its Museum —probably the best of its kind in existence—and its Library were in a satisfactory state. The one point, however, which he considered was unsatisfactory was the smallness of their numbers; it seemed a pity that professional men should not give in their adherence to the Odontological Society. Summing up the losses and gains, it would be seen that they only just maintained their numbers, for while sixteen new members had been elected, ten resignations had been accepted, and five deaths had occurred. The deaths during the year were those of Matthew Finlayson, of Edinburgh, Mn. Brasseur, of Paris, Dr. J. W. Lang-

more; A. B. Palmer, of Peterborough, and Charles Spence Bate, of Plymouth. Obituary notices of these gentlemen had already appeared in the papers, so that he need add little to what had been said. Of Spence Bate he would say that in him they had lost one of their most distinguished members. It is true that his work had lain outside the pale of dentistry, viz., in entomology. Science, however, was one, so that it mattered little whether work were done in outside lines or in special branches. Of the personal character of Mr. Spence Bate, it must be admitted it was as good as his science. Of him Sir John Tomes had said, "I regarded him as a thoroughly good fellow," and what, the President asked, better epitaph could any of them desire than that such words, written by such a man, should be engraved on their tombstones. The Odontological Society was a scientific society, and they must, therefore, ask themselves how far they had helped to advance science, for in proportion to their success in that direction must their merit as a learned society be estimated.

During the past year a considerable mass of contributions had been placed before them, both by their own members and visitors. Of the former he might specify the important discussion upon antisepticism in its application to dental surgery, initiated by Mr. R. H. Woodhouse, which dealt with matters of the greatest importance in practice. Mr. Kirby had read a no less striking communication dealing with the application of electricity to dental work, while Mr. Hepburn had from time to time favoured them with wholly practical, and therefore most valuable, communications dealing with dental mechanics. Mr. George Cunningham had read a fragment, and unfortunately only a fragment, the conclusion of which they must hope for later on, dealing with an important discovery of a crystal-forming organism discoverable in the mouth under certain conditions. It would be difficult to over-estimate the value of the descriptions which from time to time had been given to them by their Curator, Mr. Storer Bennett, as he brought forward each addition to their museum. Although falling into the category of casual communications, they possessed an especial

merit, and greatly enhanced the value of the Society's collection. Other casual communications by members of the Society had been brought forward, and were in many cases of striking interest. It was perfectly true that no new research had been undertaken in their own department, with the exception of the fragment by Mr. Cunningham, to which he had referred; still, anyone reading the volume of their Transactions for the year could not but feel that it was a valuable contribution to literature.

He then dwelt upon the contributions of those who were not members of the Society. He desired to remind them that he could take no credit to himself for the excellencies of these contributors; it was a great point, he thought, that they should have been able at all times to obtain the services of the foremost men in science as readers of papers before the Odontological Society. Fortunately such men had, not only during the past year, but during preceding years, been ready and willing to come to their Society, and contribute to its discussions. Jonathan Hutchinson, one of the foremost in scientific surgery, had made a most valuable contribution during the past year, which he regretted to say, had been followed by but little discussion, owing to the regrettable fact that a bye issue had been permitted to assume the position which the whole paper should have occupied. Mr. Hutchinson's remarks on pyorrhœa alveolaris and syphilitic teeth were of the most valuable kind. An observation important in therapeutics, but which he believed had not elsewhere been printed, was that he had observed that those possessed of honeycombed teeth were frequently very easily affected by mercury—a useful hint in treatment. The contributions of Mr. J. Bland Sutton were always valuable as coming from one who had won his way to the forefront in science. Of Dr. Ferrier he would say that his paper had been at once complete and valuable, in that it contained much that was practical, in spite of the abstruse subject with which it dealt. A fact of practical value which it contained was that visceral neuralgia is commonly associated with and due to some lesion of the trunk or branches of the fifth pair

of cranial nerves. Dr. Felix Semon had given them a paper conspicuous for its modesty and ability, and that night they had themselves heard, and were able to gauge the merits of the paper which Dr. Scanes Spicer had been so good as to read.

As they had been able to obtain first-rate men as readers of papers, it was most important, he thought, that they should guard themselves against men who were not truly scientific, and in the future maintain the high standard to which they had so far been able to attain. It must be quite evident that, were a society like theirs limited to so finite a subject as dentistry, it could not long continue if it confined itself solely to its speciality; they must, he thought, go on to the wider range of the collateral branches of science. Such a course would still subserve the practical ends of their science. Indeed, if they were to advance at all, it was incumbent upon them to keep in touch with the progress of science of the day. Instances proving the truth of this were easy to find; thus Dr. Ferrier's paper, although treating of matters quite outside the range of dentistry proper, was yet germane in every word to that subject. He would like to say a few words on criticism, as he could not but help feeling that in that particular the Society was deficient. The younger men—and he must class himself in that category—did not do their duty in criticising. The discussions were carried on for the most part by the older and tried members. Excuses were often made that immediate criticism of a new subject was at once difficult while it was of slight value, but that excuse was not a valid one. Those who possess a sound knowledge of the rudimentary branches of that profession, anatomy, chemistry, and physiology, would often be able to help the reader of a paper by the use of criticism from the standpoint of that rudimentary knowledge. Criticism need not be, and should not be, discourteous. All true scientists are anxious for criticism, and do not fear it. If they, as a Society, were anxious to maintain the *prestige* of former days, their younger men must grow more critical, more ready in debate, and more anxious to take upon their shoulders the

burden of the discussions. There was no doubt that the older men could pick out with ease the points in a paper; but this was simply a question of practice. The reputation of a profession was the reputation of the aggregate of its members, and this will always be on a level with the reputation of the average member. As this was the case with medicine, so was it with dentistry, and hence the grave responsibility thrown on the individual to strive after a high ideal of excellence.

During the meeting the following members were elected as officers and councillors for the year 1890:—

PRESIDENT.
Felix Weiss.

VICE-PRESIDENTS.
Resident: F. Canton, J. Stocken and David Hepburn.

Non-Resident: J. Cornelius Wheeler (Southsea), W. Bowman Macleod (Edinburgh) and J. H. Redman (Brighton).

TREASURER.
Thomas Arnold Rogers.

LIBRARIAN.
Ashley Gibbings.

CURATOR.
Storer Bennett.

EDITOR OF THE TRANSACTIONS.
Walter Coffin.

HONORARY SECRETARIES.
E. G. Betts (*Council*), J. Ackery (*Society*) and W. A. Maggs (*Foreign Correspondence*).

COUNCILLORS.
Resident: R. H. Woodhouse, L. Matheson, W. Scott Thomson, C. S. Tomes, F.R.S., Willoughby Weiss, W. H. Woodruff, W. Hern, F. Newland-Pedley and C. J. Boyd Wallis.

Non-Resident: T. C. Parson (Clifton), R. T. Stack (Dublin), F. J. Vanderpant (Kingston-on-Thames), M. de C. Dickinson (St. Leonard's-on-Sea), A. A. de Lessert (Aberdeen), Alex. Fothergill (Darlington), W. B. Bacon (Tunbridge Wells), H. B. Mason (Exeter), and Mordaunt A. de C. B. Stevens (Paris).

Votes of Thanks to the Retiring Officers.

Mr. Henri Weiss proposed a vote of thanks to the President and past office-bearers of the year, speaking in eulogistic terms of the services they had rendered the Society.

Mr. Maggs, in seconding the vote, said that the President had upheld the honour of the chair and carried out his duties alike with tact and ability.

The usual votes of thanks to contributors of communications having been passed, it was announced that the next meeting of the Society would take place on Feb. 3rd, when the President, Mr. Felix Weiss, would deliver his Inaugural Address, and a short paper would be read by Mr. George Cunningham on "An International System of Dental Notation," and a paper by Mr. William Mitchell on "Clinics and their Effect on Dental Societies;" a casual communication by Mr. William Hern on a "Case of a Buried Molar in the Lower Jaw."

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

February 3rd, 1890.

MR. FELIX WEISS, L.D.S.,

PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

The LIBRARIAN (Mr. ASHLEY GIBBINGS) announced that he had received for the Society's Library a copy of M. Dubois' "Aide-Memoire du Chirurgien-Dentiste" and the usual journals.

The CURATOR (Mr. STORER BENNETT) presented sections of the skull of a collared peccary; the animal had died before the milk teeth had been lost, but subsequently to the eruption of the first permanent molars; the tips of the permanent canines were just erupted. The sections had been prepared by cutting away the outer alveolar plates, so as to show the roots of the teeth already formed and the crypts of those in process of development. Mr. Bennett pointed out that the dentition of the peccaries differed from that of the true pigs, such as the wild boars, in having only thirty-eight teeth instead of forty-four; the dentition of the peccaries being

$$i\,\frac{2}{3}\quad c\,\frac{1}{1}\quad pm\,\frac{3}{3}\quad m\,\frac{3}{3} = 38;$$

that of the pigs being

$$i\,\frac{3}{3}\quad c\,\frac{1}{1}\quad pm\,\frac{4}{4}\quad m\,\frac{3}{3} = 44.$$

Mr. Hern communicated the notes of a case of buried lower molar in the body of the lower jaw as follows:—

The patient, Louisa W., æt. thirty-eight, gave the following history: Patient presented herself at the Dental Hospital early in 1888, complaining of a small swelling on the lower part of the right cheek. She states that this occasionally gets larger, and when it does so the whole of the right side of the face up to the ear becomes swollen. She also complains of occasional neuralgic pain on that side of the head and face, as well as some pain and stiffness under the jaw on the same side.

Present State.—There is a small swelling situated on the lower border of the body of the lower maxilla, on the right side, about midway between the symphysis and the angle. It is painless, or only slightly tender to firm pressure by the finger. It is freely movable under the skin, but moves with greater difficulty on the subjacent tissues, being apparently bound down to the bone.

On examination of the mouth, the alveolar portion of the jaw on that side appears rather thick, but there is no obliteration of the sulcus between the jaw and the cheek. There are only two molars present on that side of the jaw, the anterior of which leans somewhat towards the second bicuspid; but the patient cannot remember whether a tooth has been extracted. All the teeth *in situ* on this side of the lower jaw were found to be free from caries.

The second bicuspid, however, appeared rather darker in colour than its neighbours; and, being slightly loose and somewhat tender to percussion, was thought to be dead, and therefore a probable cause of the swelling on the outside of the jaw in the neighbourhood of its root. The house surgeon was consequently requested to remove the tooth. In doing so it was unfortunately fractured (the accident, however, was greatly due to the very dense and resisting nature of the alveolar border). I subsequently saw the patient in the gas room, and attempted to remove the fragment of root under gas; but the patient came round very rapidly, and I failed. My experiences of the depth of the fragment in the socket and the density of the surround-

ing bone led me to refrain from further attempts at extraction unless the symptoms demanded it, and I advised waiting awhile before operating further, meanwhile keeping the case under observation. The patient was seen shortly after, but no change had occurred, and she was requested to present herself in three months. The patient's vocation prevented her compliance with this request, and six months had elapsed before I saw her again.

Note of Condition in August and September.—Occupying the position of the small swelling on the border of the jaw was now the papilla of a sinus; and patient states that a short time ago, having to take some children to see the doctor, she asked him at the same time to look at her cheek, as a little swelling had come to the surface of the skin. The doctor thereupon opened it with a probe, and a little matter came away.

I examined the mouth at this time and probed the socket of the bicuspid tooth, which was now so contracted as only to admit the end of a silver probe with difficulty. In doing so I was rather surprised to get in the posterior and deepest part of the socket a sound which I thought had the ring of enamel against the probe. I advised the socket being stuffed with lint and the patient to come in a week. On her reappearance she said the lint had come out, but the socket was dilated to the size of a crowquill, and I was enabled to manipulate the probe with greater freedom. At this visit I again struck enamel with the probe, and, further, thought I could map out the elevations and depressions of the crown of a tooth. I now wished the patient to come up and allow me to dilate and explore the socket more thoroughly, but she could not do so then, as the visits interfered with her work. It had, therefore, to be deferred for two or three months.

On the patient's return in November I instructed the house surgeon to pack the sockets tightly with gum sandarac and wool every alternate day for a week. This dilated the socket to the size of a blacklead pencil, and enabled me to confirm my diagnosis and to see at the

deepest point the white enamel of the tooth crown, also to trace its surface backwards to a considerable distance under the anterior molar with a probe. The case was now seen by my colleague, Mr. R. H. Woodhouse; and, as the superjacent molar tooth had no antagonist in the upper jaw, he advised its removal, in the hope that the buried tooth might rise up and that the sinus, which at this time was freely discharging on the cheek, might heal up. I therefore removed the molar under gas, and advised a further period of rest.

Patient seen again in about two months—Jan., 1889. My note runs: No apparent change in the position of the buried tooth, or in the condition of sinus, which discharges freely.

In February, 1889, patient was again seen, and as no change appeared to have taken place in the position of the tooth, while the discharge through the sinus on the cheek was such as to greatly annoy and disfigure the patient, I decided, after dilating the socket with guttapercha, to place the patient under an anæsthetic and try to remove the buried tooth through the socket of the extracted molar tooth. Gas and ether were administered, and I attempted to remove the tooth with a curved elevator. I succeeded in moving and raising it, but after using as much force as I thought advisable in a jaw weakened as I judged this must be with such a cavity in its body, and finding the bony surroundings were too contracted to allow the contained tooth to come out, I desisted, and abandoned all hope of removing it without freely enlarging the bony orifice. As this would involve a somewhat lengthy and delicate operation, and necessitate the patient being kept in bed for perhaps some days afterwards, I asked my colleague, Mr. A. Pearce Gould, to take the patient into Middlesex Hospital under his care. This he very kindly consented to do.

Previous to any operative procedure we had a consultation together, when the possibilities of the buried body being an odontome of some size were taken into consideration. Mr. Gould decided to cut away the outer wall of

the alveolus sufficiently to allow the tooth to be removed through the dilated socket of the molar, which had been removed.

For some days previously to operating, the socket was packed with soft gutta-percha; on one of these occasions, when changing the plugs, I procured a model of the tooth *in situ*, by first squeezing a piece of gutta-percha into the dilated socket and then taking a Stent's impression of the whole arch. This I saved.

On March 27th, 1889, the patient was taken to the operating theatre at Middlesex Hospital, and placed under chloroform. Mr. Gould then carefully retracted the soft tissues overlying the bone and proceeded to cut away the outer wall of the bone with the dental engine. This was continued until, with a curved elevator and a pair of forceps, we were enabled to coax the tooth out of its bed and grasp it with the forceps. I placed the tooth on the impression before alluded to, and made the model which I now show (see fig. II.). This gives a better idea of its position than pages of description could do.

The buried tooth (Fig. I., A & B) presents some abnormal features. The crown is that of a molar with rather pointed cusps, and its enamel is marked here and there with several dark lines and depressions very similar in appearance to those produced by incipient caries in the fissures of erupted teeth. Running upwards on the buccal surface of the crown from the point of bifurcation of the roots to the posterior cusp is an elevated ridge of somewhat soft bony material, which appears to be a cemental deposit. The buccal surface of the roots is eroded in several places into small irregular cavities; one of these near the termination of the posterior root is as large as a No. 4 shot.

The anterior root is abruptly curved backwards near its point, and is joined to the posterior, apparently by secondary deposit.

Remarks.—The case appears to me to present several points of interest.

(*a.*) The length of time during which the buried tooth had lain dormant.

(*b.*) The absence of much pain, considering the position of the tooth and its anatomical relation to the inferior dental nerve trunk.

(*c.*) The absence of any amount of swelling or thickening of the body of the jaw.

(*d.*) The obscurity of the early symptoms, and their disproportion to the pathological condition.

An interesting question arises as to which tooth the buried one represents. It must, I think, be either a first molar or a wisdom tooth, and I am inclined to consider it a first molar for the following reasons :—

(*a.*) Its position between the second bicuspid and contiguous molar.

(*b.*) The shape and size of its crown.

(*c*). Oblique direction of the superjacent tooth towards the bicuspid.

(*d.*) The similarity of the crown of the superjacent tooth to that of the second molar of the opposite side, as well as the likeness of its roots to those of second molars generally.

(*e.*) The similarity of the posterior remaining tooth on the right side of the jaw to the undoubted wisdom tooth on the opposite side.

(*f.*) The defective condition of the enamel of the buried tooth suggests that the opposite corresponding tooth, which has lost its crown through caries, was similarly affected.

On the other hand it might be argued that wisdom teeth are most liable to irregularities of position, and that the backward curvation of the roots of the buried tooth are similar to those of very many third molar teeth. I venture to think, however, that the balance of evidence goes to show the buried tooth to be a first molar.

Very little blood was lost at the operation, and the patient left the hospital the next day. The discharge on the cheek stopped at once and rapidly healed, and the cavity in the jaw soon granulated up. I insert a model of the jaw taken a few days ago, which, I think, shows how completely the retracted periosteum restored the lost tissue.

Mr. Pearce Gould said he could add very little to the

interesting account which Mr. Hern had given. The operation which he did was to enlarge the opening in the body of the jaw and remove the buried molar. The operation was done by making an incision along the side of the jaw,

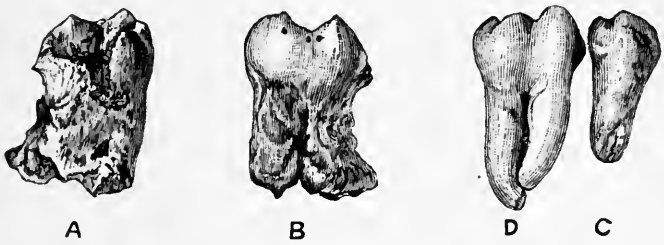


Fig. I.

A—Buccal surface of buried tooth.
B—Lingual surface of tooth.
C—Second bicuspid tooth first removed.
D—Molar tooth immediately behind and contiguous to C; extracted in November, 1888.

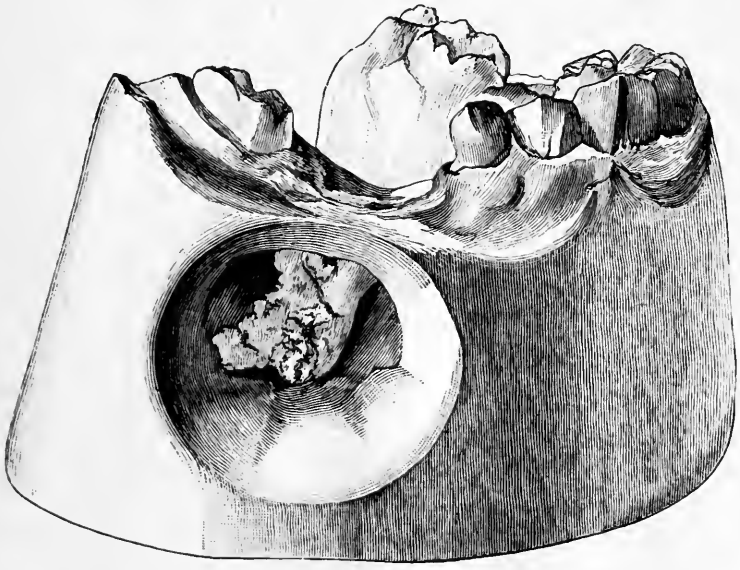


Fig. II.

and then with an ordinary surgical elevator the periosteum and soft parts were stripped off, great care being taken to preserve as much periosteum as possible. Then with the dental engine and some burrs specially designed by Mr. Hern, the outer wall of the alveolus and a small

portion of the body of the lower jaw were removed. The dental engine, Mr. Pearce Gould added, enabled him to perform the operation with an ease and success which otherwise would have been wholly impossible. The patient made an excellent recovery, the sinus healing up, and she left the hospital the day after the operation. One interesting point about the case was the complete restoration of the body of the jaw, but probably none of the alveolus, showing that after removal of a tooth there is absorption of the alveolus and no tendency to its regeneration. Another point of interest was that, owing to the small size of the jaw and the large size of the tooth, the inferior dental nerve must, if it had followed its normal course, have been seen during the operation, and run the risk of being damaged; possibly it dipped down.

The PRESIDENT then called upon Mr. George Cunningham for his paper.

The International Dental Notation.

By George Cunningham, M.A.Cantab., L.D.S., D.M.D.Harv.

At the International Dental Congress held in Paris, in Sept., 1839, Mons. Grosheintz, of Paris, made an interesting communication entitled, "Dental Stenography," in which he suggested certain symbols which he hoped to see become international—so far as the dental profession was concerned. The main features of the communication may be briefly summarised as follows :—

(1) He proposed to represent the teeth by the first letter of the Latin words which are ascribed to them ; for instance, for the bicuspids he employed "B" for the first, and "b" for the second, and the same for the incisors and so on.

(2) Two lines, one horizontal and the other oblique from above or below, would serve to designate by the opening of the angle the right side or left, and by the superior or inferior position of the oblique line to which of the two jaws the tooth belongs.

(3) The temporary teeth (*dents caduques*), are designated in the same way, with the addition of "c" as exponent.

(4) Then by the aid of the figures 1, 2, 3, 4, placed according to the case after the denominative letter, the degree of caries is indicated.

(5) The surfaces attacked by caries are also designated by letters.

(6) He also suggested a series of abbreviations to designate the disease, the medicaments, and the materials employed in filling.

Mons. Dubois, of Paris, whilst strongly supporting the objects sought to be obtained by Mons. Grosheintz, criticised very strongly his symbols, more especially those devoted to the teeth. He then explained the method which he had adopted and recommended in his book, *Aide-memoire du Chirurgien-dentiste.* This method will be explained presently.

Mons. Schwartz, in criticising the symbols suggested, said that he, too, would prefer to see the teeth designated by figures instead of by letters.

I then had an opportunity of explaining the features of a system of notation which has been employed both by others and myself with considerable success for a considerable number of years. As a part of this system we had adopted the method of numbering the teeth employed by Dr. Finley Thompson, who began numbering from the right upper third molar, and counting straight on to the same tooth on the left side, and then continuing from the lower third molar on

the left side to the one of the right side, thus finishing opposite where he had commenced. This was done simply to avoid confusion, since his chart of the teeth, and the respective numbers attached were already in use in this country.

Candour compelled me to freely admit that this, of all the systems of numbering, was the very worst, and that years of constant daily use of the system had failed to give me the power of at once recalling with certainty the numbers indicative of certain teeth. Whereas one was able to memorise the Dubois system by five minutes' study for as many, if not fewer, consecutive days.

Mons. Trallero, of Barcelona, proposed that, since the question was one of great interest, and several different systems had been suggested, a commission be nominated to consider the subject and report thereon. This proposition having been accepted the commission was duly nominated as follows :—MM. Grosheintz, Dubois, Schwartz, Trallero and myself.

This commission, first of all, decided that it was better to adopt a system of figures rather than one of letters to designate the various teeth. It was found that all the various systems of numbering teeth by figures might be classified into three systems :

(*a*) The system of 8.

(*b*) The system of 16.

(*c*) The system of 32.

It was resolved that any system of numbering by 32 was inconvenient, confusing and difficult to memorise; it was therefore unanimously rejected.

The system of 8 was warmly advocated. It consists of 4 groups of 8 numerals starting from the median line, the respective teeth of the upper or lower jaw being indicated by the position of the numerals above or below the horizontal line, and their situation relative to the median line being shown by a vertical line on the median line side of the figures. A modification of the old system known as Hillischer's system, which substitutes a point or period for the vertical line, was also considered.

The only system of numbering by 16 which was considered was that proposed by Mons. Dubois, which consists of employing all the *odd* numbers from 1 to 15 to represent consecutively the various teeth on the *left* side of the mouth, and the *even* numbers 2 to 16 to represent those on the *right*, the lower teeth being distinguished by a line drawn underneath each numeral representing a tooth in the lower jaw.

It was the unanimous opinion that the system of 8 numerals was certainly the easiest to comprehend and to memorise. It was considered, however, that while the Dubois' system of 16 was slightly more difficult, it was yet sufficiently easy

of comprehension, and would avoid in an ingenious manner the necessity of employing any point or vertical line before or after the numerals. It was determined, however, to adopt the principle of the horizontal line as indicating whether the teeth belonged to the upper or lower jaw, which only necessitates the use of the line above the numerals in the case of a tooth belonging to the lower jaw, since the simple numeral, *without* a line below it, is sufficient to indicate its being an upper tooth. It is evident that either of the systems of 8 suggested necessitated three signs for each tooth, whereas this system of 16 only requires one, the number itself, for any upper tooth, and two, the number and a dash above, for any lower tooth.

The Commission then recommended the adoption of the following system of numbering the permanent teeth:

	Right.								Left.							
Upper.	16,	14,	12,	10,	8,	6,	4,	2.	1,	3,	5,	7,	9,	11,	13,	15.
Lower.	$\underline{16}$,	$\underline{14}$,	$\underline{12}$,	$\underline{10}$,	$\underline{8}$,	$\underline{6}$,	$\underline{4}$,	$\underline{2}$.	$\underline{1}$,	$\underline{3}$,	$\underline{5}$,	$\underline{7}$,	$\underline{9}$,	$\underline{11}$,	$\underline{13}$,	$\underline{15}$.

With regard to the temporary teeth, it was decided not to adopt the method of numbering employed in the Hillischer and other systems, which is thus expressed from the median line 1, 2, 3, 6, 7, but simply to adopt the numbers 1 to 10 on the same plan as applied to the permanent teeth, merely distinguishing the tem-

porary tooth from its permanent successor by prefixing a decimal point in front of the numeral.

It is claimed by Hillischer and others that their system of numbering the temporary teeth avoids confusion by retaining the relative significance of the numerals of the permanent set. This claim is self-evident, so far as the incisors and canines are concerned, but not so for the temporary molars, since the gap between the numbers 3 and 6 is decidedly confusing. It was deemed, therefore, simpler and less confusing to utilise the same numbers for the deciduous molars as were employed for their successional teeth, the bicuspids, and not those of their mere namesakes.

The following system of numbering the temporary teeth was adopted:—

	RIGHT.					LEFT.				
Upper	·10,	·8,	·6,	·4,	·2,	·1,	·3,	·5,	·7,	·9.
Lower	·10,	·8,	·6,	·4,	·2,	·1,	·3,	·5,	·7,	·9.

With regard to the symbols to indicate the surfaces of the teeth, it was decided to adopt those employed in the system of notation which I have published. The only difficulty was with regard to the symbol representing the crown or masticating surfaces. This simply arose from the difficulty in finding an equivalent which would be the same in the various languages.

The term "crown," or even the mere term "coronal," it was urged, is not employed in France * to indicate the masticating surface. It was, therefore, determined to substitute "t" instead of "c" for the crown surface, as being the corresponding mnemonic contraction for triturating surface (F., *Surface triturante;* L., *Superficies triturans;*). It was also determined that, since labial and buccal are only two different names descriptive of the same surface, only one symbol, viz., "l" for labial, should be employed; the same remark equally applies to the terms palatal and lingual, and therefore only one symbol, viz., "p," has been adopted. The symbol signifying cervical is a segment of a circle; by accentuating the curve the sign can be made to graphically indicate the extent to which the cervical margin of the tooth is involved.

The following symbols were therefore adopted for describing the surfaces of the teeth :—

t., triturating (synonyms : crown, coronal).

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* At the time of the Commission, had I remembered that Dr. Andrieu had adopted the term "*coronale*" in his *Traité de Dentisterie opératoire*, p. 353, as applicable to "la surface triturante des dents postérieures," I should not have yieided so readily to what seemed a necessary change, since a cardinal factor in the success of any system must be its freedom from any capricious changes.

m., mesial.

d., distal.

l., labial (synonym : buccal).

p., palatal (synonym : lingual).

⌣, cervical.

By means of the first five signs and their obvious combinations, such as mesio-palatal, disto-lingual, and so on, it is easy to sufficiently define even any irregularly-disposed carious cavity, *e.g.*, a cavity extending from the mesial over the crown to the distal surface is sufficiently described by the letters, m.t.d. If, instead of a single compound cavity, it is desired to indicate three separate cavities on these several cavities, the use of the colon is sufficient to distinguish the difference thus—m : t : d :. The colon is always and solely employed to define the localisation and the operative terms, and so prevent confusion with any adjacent symbols.

It was further determined not to suggest any further series of abbreviations for the present, as it would be advisable to consider the various systems suggested at greater leisure than the present occasion afforded.

It was further recommended that some mnemonic system, such as that recommended by myself, was more likely to lead to satisfactory results than the system of arbitrary signs so commonly used in America.

This mode of notation, recommended by the Commission, was unanimously adopted by the Congress at its final session.

Despite the fact that this Society, in common with other dental societies, has not hitherto devoted much attention to this subject, I think it is unnecessary to dilate upon the very obvious advantages of having some one carefully considered system of notation accepted for common use. I trust you will agree with me in thinking that it is a matter of congratulation that the corporate intelligence of the profession has at last been aroused to the urgency of united action in this matter, and thus made a beginning of reducing to uniformity and order the somewhat chaotic productions of the various individual intelligences which have found expression in occasional contributions to various societies and journals, not only in this country, but also in America, France and Germany. I therefore recommend a trial of this International Dental Notation as being easy of acquirement, time-saving, and eminently practical. Its ultimate value will depend upon the extent to which it is adopted by the profession. Its value to the individual in keeping a record of his work, in communicating with an assistant, and in corresponding with another practitioner, is evident. But before such a Society as this I would urge its value to

science, if only from its help in transforming the crude, almost entirely commercial, entries of the day-book or ledger into the carefully recorded facts of the case book, the tabulation of which will certainly do much to remove the endless records of vague, unverifiable conclusions with which our scientific literature abounds.

Discussion.

Mr. H. Baldwin thought it was quite worth while settling upon some definite plan of dental notation, but felt that the old notation seemed better than the so-called international notation. To make the angle on the right or left side comes perfectly natural, and if you took only eight figures, you could learn the whole of them permanently in a few minutes, whereas there was an element of caprice in the international system.

Mr. W. H. Coffin, speaking in the same lines, believed there was an element of confusion which would not infrequently arise; if, in the notation recommended by the Commission, one wished to write down a left superior central and lateral by the figures one three, that would be thirteen, which designates the second molar on that side. Or if a central and canine were noted, the figures one five might be mistaken for fifteen, which designates the wisdom tooth on that side. By the old notation one can designate quite generally the class of tooth, such as a first bicuspid, by the proper figure, without any other sign.

Mr. G. Cunningham, replying to Mr. Coffin's criticism, pointed out that the figures one and three are distinguished from thirteen, as they usually are distinguished, by a comma. With reference to Mr. Baldwin's remarks, as a matter of fact the printers cannot print the old notation without having type specially made, and therefore he maintained it was an advantage if a system can be provided which does not require a special type.

The President then delivered his inaugural address as follows :—

PRESIDENT'S INAUGURAL ADDRESS.

Gentlemen,—Perhaps the most difficult task that devolves upon any one occupying this chair for the first time, is fitly to accept and acknowledge the honour that has been conferred upon him. Year after year we have been accustomed to receive a presidential address which has exhibited, if it has done nothing else, the high estimation in which that honour was held and the gratitude of the recipient for the professional good-will thus shown towards him. When we look through the roll of honourable names which have for thirty-three years gone before, we cannot fail to recognise an assembly well calculated to make the stoutest heart hesitate and ask himself, "Am I worthy to follow the distinguished men who have preceded me?"

If similar thoughts to these have agitated former presidents, how much more so should they disturb me, the last elected and least worthy of those who have sought your kind indulgence; for however much the world's friction may make us callous of the world's opinion, the esteem of those with whom we have toiled, and step by step advanced in professional life, must carry with it a lasting interest. To me the occasion is the more memorable, for it marks the generous way in which good intentions—laudable endeavours, more than achievements of a distinguished nature—are acknowledged and rewarded. To the younger members of the Odontological Society my elevation to this chair presents a lesson that should never be forgotten, for it tells them how willingly the heads of our profession are ready

to recognise patient industry and a contempt for charlatan practices. Recalling what my experience has been I must be excused if for a moment I look back and contrast the present position of our profession with what it was when I entered it, over fifty years ago. I still recall the confusion of many projects advanced with much warmth—for we had many earnest men in those days, and I feel fully persuaded that without the discussions which then filled the air, we could hardly expect to have attained the calm unanimity we now enjoy. Many weary hours and many anxious meditations marked those days of professional progress, and the record should not be passed over or its influence forgotten. I see the uppermost chamber of the house in Hanover Square where the olive branch was first held out, nor can we ever forget the kindly interest that watched our councils, for the name of Arnold Rogers will ever be associated with this memorable period, and I feel convinced that the last hours of his existence were made happier by the knowledge that he had contributed in some measure to consolidate the union of the profession he loved so well. Of the eight who constituted this memorable council, one-half have passed away. Every member of that joint committee had the welfare of the profession at heart, and, although their views differed, when earnest men with good intentions meet together it is astonishing how soon discord vanishes. Then, again, when as a united assembly we met under one roof it was not difficult to foresee that this Society was entering upon days of prosperity and advancement—indeed, it is most gratifying to note how willingly the two sections of our calling blended, for all were influenced alike, and the actual unity of the profession was what they most

desired. This has been so clearly explained by my old and worthy friend, Samuel Lee Rymer, in his address as President of this Society, that I might have passed the matter over, although I can never sufficiently thank you, Gentlemen, for the uniform kindness exhibited towards me on all occasions, and more particularly when first entering into your councils and joining in your debates; and, perhaps, I might here bear testimony to the anxious manner in which your Council conducts its affairs. I have been, as you know, an office-bearer for many years, and during the whole of that period a pretty constant attendant. While bearing testimony to the harmony which has ever distinguished the Council's deliberations, I must emphatically declare that its dealings have been conducted with perfect fairness and equality; there has been no approach to cliqueism, every office being filled with a desire that the most serviceable men should be elected—those members at least who have shown their love for their profession and their desire to advance the best interests of the Society.

With these introductory remarks I beg you to accept my congratulations on this progress, but I cannot help asking myself whether it might not be a profitable study while looking back to consider man as one link in that continuous chain which is ever repeating itself. Our immediate past President in his address called your attention to the question of heredity, as it involves the dental characteristics of parents transmitted to their offspring, and the subject is one that has not, so far, received a very large amount of attention, although its importance has been recognised. We speak of the teeth of children closely resembling the one parent or the other, and it is said that the girls as a rule

take after the father, the boys after the mother, but I question the correctness of these surmises—at least fifty years of careful observation on my part has not confirmed these conclusions. That the teeth greatly resemble the one parent or the other I feel convinced; that this resemblance is not confined to mere shape, but is carried out in their structural condition and their position in the mouth, I feel thoroughly persuaded. I believe that there is no confusion in this arrangement, but that the one parent or the other transmits these organs—that you will not have the shape of the father with the regularity or the irregularity of the mother, but that each child shall distinctly inherit from the father or the mother the teeth in their shape, their position, in their health or their disease. The strength of the law which determines the transmission of character from parent to child is still far from receiving that attention it merits, and is unquestionably, even in the present enlightened days, but little understood. A somewhat eccentric author named Alexander Walker years ago wrote very fully on this subject, and tried to prove that each parent communicated a distinct series of organs; that the male and the female on the average exercised an equal influence in the form and the mental characteristics of the progeny. "That where the father was young and vigorous he gave the locomotive system and the back portion of the head, the mother conferring the forehead and the vital system," and he adds, "this arrangement is preferable because it is in these systems that each excels."

Dr. Walker has illustrated his views by a number of drawings and a variety of cases taken from personal experience, and amongst other things he observes "that the

capacity of children for learning will depend upon the educational aptitude of the parents, for the natural dulness of children born of uneducated parents is proverbial."

In some respects it is to be regretted that Dr. Alexander Walker (for at least he was a very industrious examiner) neglected to observe the teeth, for I think if he had done so he would have been able to confirm or to refute many of his favourite theories. Sir Henry Holland very happily remarks that the real subject for surprise is not that any peculiarity should be inherited, but that any should fail to be inherited; and Darwin remarks that the most correct way of viewing the whole subject would be to look at the inheritance of every characteristic as the rule and non-inheritance as the anomaly.

"It is obvious," says an anonymous writer in one of our journals, "that instances of inheritance are most likely to be noticed and recorded when the inherited peculiarity is striking and abnormal. A slight peculiarity of feature, complexion, or voice will readily pass unnoticed, but if a striking deformity be inherited, or some disease pursue a family through several generations, it can hardly escape the most careless observation. Cases are on record of families whose members were characterised by the possession of a supernumerary digit on the hands and feet, and this remarkable peculiarity has been transmitted through five generations, showing how strong is the force of inheritance even in such a minor detail of structure. A still more singular instance is that of Lambert, the well-known 'porcupine man,' whose skin was thickly covered with warty projections, which were periodically moulted. He had six children, who were similarly affected, and two of his grandsons inherited the same

peculiarity. The writer is acquainted with a gentleman who has a marked drooping of the left eyelid. His son inherits this peculiarity, but in a less remarkable degree. One of the most singular instances of inheritance is that recorded by de Candolle. There was a family in France of which the leading representative could, when a youth, pitch several books from his head by the movement of the scalp alone, and he used to win wagers by performing this feat. His father, uncle, grandfather, and his three children possessed the same power to the same unusual degree. This family became divided eight generations ago into two branches, so that the head of the above-mentioned branch is cousin in the seventh degree to the head of the other branch. This distant cousin resided in another part of France, and on being asked whether he possessed the same faculty immediately exhibited his power."

A few more examples of this transmitted resemblance may not be altogether out of place.

I shall never forget that in the very early days of my professional life, while walking down a side street where some workmen had placed a large looking-glass prior to its being taken into a van, I suddenly started back, for there I saw the resemblance of my father as he appeared in life, and it was some seconds before I discovered that it was the reflection of my own image I was gazing at.

Many years ago the son of a very old friend left this country, and away from home grew up to man's estate. Accidentally meeting the father I said to him, "If I had not been convinced that your son was thousands of miles away, I should say that I met him in the street a few days ago." "Why should you imagine," my friend inquired, "that it

was my son you saw? for he was a mere child when he left this country, and that is twelve years ago." I answered that it was a certain peculiarity in his locomotion and the manner in which he carried himself and turned out his feet that recalled this resemblance to his father. The son had returned, and his walk was so exactly like that of his parent I recognised him from this resemblance.

These instances of transmitted likeness might be extended *ad infinitum*, and I know, gentlemen, that you can all of you recall similar cases. I would now like to allude to those peculiarities of manner and taste not so readily noticed—I mean more particularly where children have been separated from their parents at an early age and could not in any way have copied the habits of their ancestors.

I once knew an old lady who, regularly as night advanced and she became drowsy, rolled the knuckle of her right hand in her eye, as a child is commonly accustomed to do when it cries. The son, now an old man, does exactly the same thing, and until I told him of the habit, he was not aware that he did so, or that his mother ever did so before him. Again, how frequently do we find men and women whose fondness for certain kinds of food and whose dislike of certain articles of diet, bears the strongest affinity to that of their parents. As a boy, I once knew a matter-of-fact woman, who was free from the slightest affectation, and yet she would faint away the moment she came into a room containing a particle of cheese. So incredulous was I as a boy, that once I put a fragment under her chair and saw her precipitately leave the room in a fainting condition. This idiosyncrasy, so the lady said, was shared by her mother and some of the females in her family.

I once dined at the same table with a well-known literary gentleman, who could not tolerate the smallest fragment of onion in any food he partook of. On the occasion when I met him he only tasted one spoonful of soup and yet he declared he knew from his feelings that it had been flavoured with onions. The gentleman of the house (for it was a bachelor's dinner party), knowing the peculiar condition of his friend's stomach, had given the strictest injunctions that no onion should be used in the manufacture of any dish placed on the table; but the cook acknowledged that she *had* used a very small quanity of a flavouring sauce which evidently contained onion. This gentleman said that both himself and his father were so sensitive that the presence of this vegetable would at once cause them to vomit.

But I will now, with your permission, pass on to the consideration of those organs which admit of a more careful examination and classification—I mean the teeth. A striking instance of inheritance is often hailed as wonderful and inexplicable; yet such cases are merely exaggerated examples of a phenomenon of which every family, nay, every individual, affords proof. I desire more particularly to confine myself to hereditary peculiarities in the teeth and their position in the mouth generally. Peculiarities in shape are very common. For many years I attended to a gentleman, all of whose superior molars had a well-defined cusp on the lingual side. Such a form of tooth is not unusual, but the cusp in this instance sprang from the lingual face of the tooth and looked like a small canine attached to its side. I have had six of the children under my care, and four of the boys have

similar cusps springing from the same molar. A very peculiar fact in connection with this case is that two of the younger children of the same family, a boy and a girl, under six years of age, had this characteristic spur of enamel growing from the lingual side of the temporary molars also, and I have on more than one occasion noticed peculiarities of the deciduous teeth imitated in the permanent set.

It is not an unusual thing to see peg-shaped teeth taking the place of the lateral incisors, and in one more than usually defined case I perceived both mother and daughter similarly constituted. Irregularities in position, both of the upper and the lower jaw, are commonly transmitted from parent to child, the projection of the lower jaw being the most frequent. Individual teeth — the canines, for instance, taking their position outside or inside the circle, may be seen in many families, although irregularities at the present day are more generally corrected by the dentist early and abnormalities removed. Hereditary variations in the relative positions of the jaws themselves commonly occur, the lower teeth in some cases crossing the plane of the upper. In two instances I have noted, the superior incisors were greatly in advance of the lowers, and in both cases the mother and daughter strikingly resembled each other, more particularly when at the same age, which an extended practice gives the dental surgeon the opportunity of seeing. But an equally frequent irregularity is where the upper teeth are inside the lower circle when the mouth is closed, which is commonly called "underhung." Every one must have noticed the change this peculiarity makes, not only to the expression of the face, but also the tone of the voice.

The following well-defined case shows the hereditary transmission in a very marked manner. The father had a powerful square-looking lower jaw, boldly in advance of the upper circle, which was rather small, the teeth being of moderate size. The mother had a mouth of perfect regularity, the jaws and the teeth being well and evenly placed. The eldest son had a set of teeth exactly like the father's, with the same expression of face and the same projecting lower jaw. The second child, a girl, also resembled the father, the teeth of the upper jaw being so distressingly crowded that many had to be removed. The third and fourth children, boys, had perfectly regular teeth like those of the mother, fifth and sixth, both girls, exactly resembled the father. All these cases I had an opportunity of seeing frequently and from a very early period, and it must be particularly noted that the third and fourth children (boys) followed the mother, while the four other children resembled the father, the eldest being a boy, but the three youngest girls, all, both boy and girls, following the father in the strongly marked character of the teeth. Turning to the hereditary transmission of caries, I acknowledge that I have to overcome great difficulties in arriving at any satisfactory conclusions. If caries can be proved to be hereditary, it should be detected in parent and child at about the same period of life; and how is this to be demonstrated, unless the dental surgeon keeps a very careful record of every case? It is easy enough to perceive any transmitted peculiarity in arrangement, for the mother may possess a comparatively perfect set of teeth at the age of forty, and have a daughter, aged twenty, in whom that similarity of arrangement may be readily detected. Again, it is possible for the parent to have

lost, and to continue to lose, teeth by chronic inflammation of the dental periosteum, while the child is experiencing an attack of the same malady. "All my family lose their teeth in this manner: they fall out perfectly sound," is a remark we are accustomed frequently to hear, and see illustrated by a succession of cases; but the hereditary transmission of caries, if capable of proof at all, can only be demonstrated after years of patient research, and its consideration should be entered upon with the greatest caution, for that which might be regarded as conclusive may prove to be simply a *coincidence*. Still, I have many cases that are worth recording, from which I have selected the following:—

Mrs. B. brought her daughter, sixteen years of age, to see me. She had a fine, regular set of teeth, in no way crowded or characterised by any deformity whatever. The girl had been suffering severely with toothache; and upon examination I found all the bicuspids of the upper jaw diseased; two—the posterior—so extensively that little could be done to arrest disease with any hope of success. The anterior bicuspids were at once filled with gold, and the posterior placed under treatment. An interval of about a year intervened, and the young lady was then brought to me again, but I was distressed to find that the two treated with gutta percha had become mere shells, and the remaining two showed signs of disease in other parts of the teeth. I made a very careful examination of the mouth, as I had done on her first visit, but failed to discover any trace of caries in other teeth. This lady had just completed her twentieth year when she visited me for the third time, and as all hope of retaining any portions of the four bicuspids in either a healthy or an ornamental condition was aban-

doned, they were extracted. Again the remaining teeth were examined, and they seemed perfectly healthy, and I may here remark that they continued so for many years after, when I lost sight of the case.

Upon every occasion that this lady visited me she was accompanied by her mother, who, to my surprise, did not express the slightest astonishment at the loss her daughter had sustained, but simply remarked that they (the bicuspids) were teeth she had noticed to be frequently missing, and supposed that they were very prone to decay. As I found the subject was anything but an agreeable one, I desisted from making any further remark at the time, and so the case would have ended had it not been for a visit Mrs. B. paid me alone. She was in a state of the greatest agitation, and then acknowledged that she was wearing a plate in the upper jaw with four bicuspids on it. I had previously noticed that she appeared to prevent me getting any but a casual glance at her teeth; and although I had on more than one occasion asked to be allowed to examine her mouth (a practice I have always advocated when attending to a patient's children, either for irregularities or disease), I could not detect that she was wearing any artificial work. This lady then gave me the history of her case. At exactly the same age as her daughter, the upper bicuspids had commenced to decay. They had been attended to by a competent dental surgeon, but all attempts at successfully filling them had failed; she therefore, at the age of twenty-two, had them removed.

There can be no doubt that in appearance there was a very strong family resemblance between the teeth of the daughter and those of the mother, and that none excepting the lost bicuspids had been attacked by caries.

Many years ago another case, the history of which is well ascertained, came under my notice.

Miss W. presented a remarkably fine set of teeth: they were as nearly perfect in shape, arrangement, and organisation as possible. Greatly to this lady's annoyance signs of caries appeared in all the four first permanent molars; and although every care was taken thoroughly to eradicate the decay and fill them, the disease continued to progress until finally she lost them. I had many opportunities of seeing the mother, and she mentioned to me the singularity of the case, that the only teeth she herself had lost by caries were the first molars, and that was when about eighteen or twenty years of age; that *all* her children, although possessed of remarkably fine teeth, lost their first permanent molars between the age of twenty-one and twenty-five. I had an opportunity of seeing a son and daughter (although I had nothing to do in attending to their teeth), and found, as the mother had stated, that the four molars in both cases were seriously affected. They appear to have been carefully filled, but in a few years had to be removed, although none of the other teeth showed the smallest sign of decay, and I had the testimony not only of the mother herself, but also of the son and daughter, that other members of the family had lost the same teeth.

I could follow this up by relating the particulars of many cases where the hereditary transmission of other forms of disease in the teeth has been very marked. I was asked by a young lady whether any explanation could be given as to the cause, or any treatment suggested for a severe pain that came in sudden paroxysms and extended from the mental foramen on the right to the symphysis. All the inferior in-

cisors looked perfectly healthy; one central was a little turned round and somewhat higher than the rest, and this was pointed out as the cause of pain although it was not sensitive upon pressure. The lady had continued to suffer severely at intervals for over two years, and determined to have the tooth extracted, for she appeared to be quite worn out with these repeated attacks, although the loss was a very serious one, as all the other teeth were perfect, and this tooth looked well; she had, however, resolved that she would not retain it one moment longer. The tooth was therefore extracted, but there proved to be no thickening of the cementum, nor was there the smallest trace of caries, but the fang was somewhat absorbed and its termination rugged, sharp pointed, and denuded of periosteum. From the day that the tooth was extracted all her neuralgic pains ceased, and she has not had any similar attack since. I may here remark that this lady's mouth presented rather a remarkable appearance. She had no bicuspids, their place being occupied by the temporary molars, which looked perfectly healthy, were a very good colour, and firmly set. She belonged to a family none of whom had any wisdom teeth, neither the mother, aged about fifty-five, nor any of the daughters, respectively aged twenty-three, twenty-six, and thirty.

Upon the mother visiting me I was struck by noticing that the same tooth the daughter had been obliged to have extracted, namely, the right inferior central incisor, was in the mother's case much discoloured and evidently in a state of necrosis. I asked whether she could remember ever having suffered in a similar manner to her daughter, but she was unable distinctly to recollect. As a girl she had many

attacks of neuralgia, but of late she had been tolerably free. The tooth she said had certainly been in the same discoloured state for twenty years. When I first saw the daughter I attributed the state of her mouth to some injury done to the incisor by a blow, and this impression was strengthened when after extraction I saw the peculiar condition of the fang.

The interrupted development of teeth resulting in that appearance of enamel to which the name of pitted or honeycombed has been applied is usually ascribed to attacks of illness at those periods of life when the teeth were in a state of formation. These lines may be several in number, or confined to one deeply honeycombed indentation, and according to the progression in the development of each individual tooth the situation of the lines will be apparent. I am acquainted with a lady who declared she could fix the precise dates at which one of her sons had three severe illnesses, and these illnesses were indicated by three transverse grooves the results of imperfect development at the time of these several attacks. After examining this boy's teeth my first impulse was to look at the mother's mouth, and there I perceived the same character of tooth with the three transverse grooves similarly marked. The lady had been according to her statement a perfectly healthy child, and was not aware that she had any illness in her infancy, but I can point to many cases where both parent and child have the same pitted teeth. I can refer to one family in which four of the children have the same character of teeth, and they are similar to one of the parents. Are we to infer that both parent and child had attacks of illness in their infancy, and that these several illnesses left these results? That the honey-

combed appearance of the enamel may be due to some constitutional derangement I cannot dispute, but we have children who have been perfectly healthy from their infancy presenting these blemishes, and exhibiting them of a precisely similar pattern to the parent, and I think they may be regarded as hereditary imperfections.

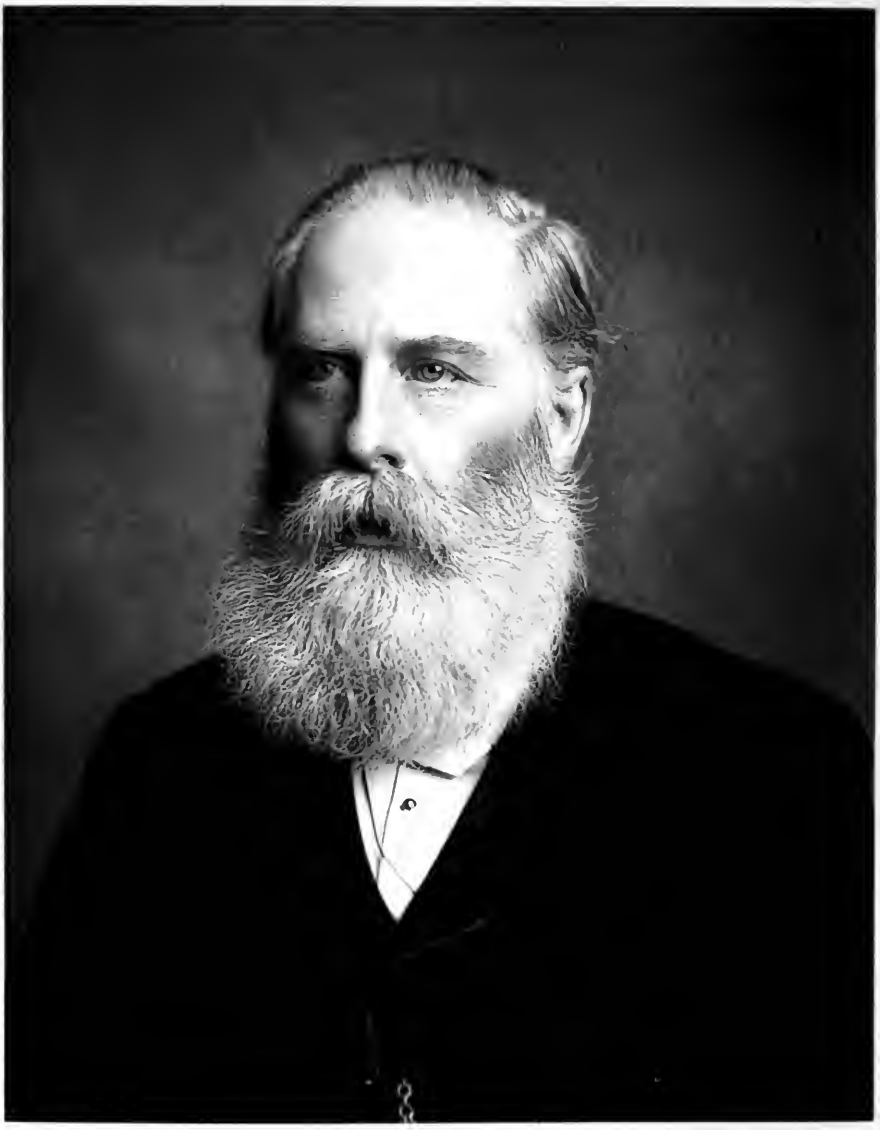
Time will hardly permit us to enter further into this interesting subject, although there is much in the history of wisdom teeth that points to hereditary influence, both as regards their number, their size and their absence altogether. In my own mind I feel convinced we are perfectly safe in drawing the following conclusions after a careful examination of both parents and children: that the teeth distinctly take after the one parent or the other, as well in health as in disease; that the intemperance of parents results in some form or other of degeneracy, commonly idiocy, frequently caries and other defects in the bony system. Diseases are known to remain latent in the system for years—why should it not be the same with the teeth? A sudden change in the character of the secretions of the mouth, and one tooth after the other decays with wonderful rapidity, and I think the cases I have quoted point to these conclusions, that the ancestral influences cause so many flaws and warps of nature that disease must be our inheritance. As Dr. Maudsley has said: "No one can escape the tyranny of his organisation—no one can elude the destiny that is innate in him. Stored up mysteriously in the nature which his ancestors transmit to him, he inherits not only the organised results of the acquisitions and evolution of generations of men, but he inherits also certain individual peculiarities or proclivities which determine irresistibly the general aim of his career."

Votes of Thanks.

At the conclusion of the address, Mr. J. Smith Turner moved, and Mr. Morton Smale seconded, a vote of thanks to the President for his admirable address. This was, on being put to the meeting, carried by acclamation.

The customary votes of thanks to the contributors of the evening having been passed, the President announced that the next meeting would take place on March 3rd: the following business would be taken:—A paper by Messrs. J. Bland Sutton and J. Charters White on "Observations on the Structure and Development of Ovarian Teeth." Casual communications by Mr. Storer Bennett, Mr. W. F. Henry, Mr. F. J. Van der Pant and Mr. J. Ackery.

The Society then adjourned.



F. T. Palmer, *Photo.* *Woodbury Co.*

SAMUEL LEE RYMER, L.S.D., Eng.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

March 3rd, 1890.

MR. FELIX WEISS, L.D.S.,

PRESIDENT, IN THE CHAIR.

THE minutes having been read and confirmed,

Messrs. M. J. BLOOM, R. E. WOOD and J. H. REINHARDT were balloted for and duly elected.

The LIBRARIAN (Mr. ASHLEY GIBBINGS) reported the receipt of the usual Journals and two books from the United States Department of Agriculture, one of which was on the North American Fauna.

The CURATOR (Mr. STORER BENNETT) announced that he had received two specimens for the Museum. Mr. Morton Smale had presented a tooth which occupied the position of a right lower wisdom, in a lady aged about thirty-five. In appearance it was like a sphere about three-quarters of an inch in diameter, to the posterior surface of which a mass of enamel and dentine was attached, looking like two geminated teeth above, but the roots were seen to be fused into one mass when viewed from below, in fact the mass was a very interesting odontome.

The second specimen was that of a mummy cat's skull, one of a consignment recently received from Egypt, and which were stated to be 4,000 years old. The ancient Egyptians regarded cats as sacred animals, and after death their bodies were embalmed with great care—hence their present state of preservation.

It was suggested that if the specimen were macerated it would enable an interesting comparison with the skulls of cats living at the present time, so that one might observe the changes, if any, which have taken place during these 4,000 years.

Mr. Bland Sutton had only just had an opportunity of examining Mr. Morton Smale's odontome, and if it were not too late would like to say that he regarded it as extremely interesting: he knew of none like it, and would suggest that it should be cut in two parts, and illustrated in the *Transactions*. With regard to the cat's skull, he would also make a suggestion, viz., that it should be macerated and the Curator should be requested to compare the dentition with that of a modern cat.

Mr. David Hepburn, referring to the odontome, stated that Mr. Smale had shown it to him some time previously, and he (Mr. Hepburn) thought it a *left* lower wisdom tooth, partly from the curvation of the fangs, and partly because he had met with a similar case in a lady who had suffered from facial neuralgia for many months. When examining her mouth he thought it as well to examine very carefully this peculiar left lower wisdom tooth. On the buccal aspect it had a little accessory denticle; on probing it the whole of the surface yielded, and the accessory tooth seemed to collapse, showing exposed nerve. He cut off the denticle with an enamel chisel; filled the cavity with gutta percha, and relieved the neuralgic pain. It seemed to point to one fact, viz., that these little denticles were possessed of abnormally large pulp cavities; he would therefore endorse Mr. Bland Sutton's suggestion.

Mr. Storer Bennett wished to be allowed to say that he stated the tooth to be a right lower wisdom on the authority of Mr. Morton Smale, who extracted it. He would remark that it was a very interesting tooth; he presented one to the Museum some three or four years ago, which was smaller but anatomically like it.

Mr. David Hepburn would only add that the fangs were tending in a direction which suggested the tooth came from the left side, and as Mr. Morton Smale concurred with him at the time in regarding it as a left and not a right wisdom tooth his later description was possibly an inadvertent slip.

Mr. W. F. Henry made a "Casual Communication" on the subject of "Shell Corners for Restoring Defective Teeth," and remarked that his communication was rather of the nature of a suggestion. He had no doubt that they had all had patients who expressed a great objection to contour fillings in gold. The question arose, how were these objectionable fillings to be dispensed with? He had tried oxyphosphate and replaced with porcelain, but he found that unsatisfactory. He had been under the impression that porcelain corners were made by dental manufacturers, but on enquiry he found that that was not the case. Mr. Henry showed plaster models illustrating his idea, and said that the corners might be fixed on with white cement, and if a strong support was necessary, that might be given with wires, as in the case of a gold filling. His object in bringing the matter forward was to elicit an expression of opinion from the Society, and possibly, by ventilating the subject, induce the manufacturers to turn their attention to it.

The President remarked that these little shells were not difficult to manufacture, nor were they altogether new. He remembered Mr. Robinson introducing something similar many years ago. The difficulty was to get them to be permanent. He thought the suggestion might be carried out, and that shell corners might become useful.

Mr. James Stocken said that on more than one occasion he had taken pieces out of ordinary porcelain teeth and fitted them into their place with osteo stopping. He found it answer exceedingly well. It was impossible to detect the fixture, and he had seen one that had lasted three or four years, without giving signs of wanting renewing.

Mr. F. J. Van der Pant (Kingston) showed models, and remarked upon a case of non-eruption, which he regarded as somewhat singular. The models were taken from the mouth of a boy aged fourteen. In the lower jaw the posterior bicuspids, permanent canines on the right side, and central incisors were absent; one temporary incisor was standing. In the upper jaw both permanent lateral incisors were wanting, and the deciduous canine stood distally to the permanent canine on the left side—that he also regarded as somewhat singular. He had great pleasure in presenting the models to the Museum.

Mr. Charters White observed that the case was a very interesting one. Occasionally such cases came before most practitioners, and the parents were anxious to know what was going to happen. Mr. White had a similar case the previous week, and the only comfort he could give the parents was that the teeth were probably somewhere, and would eventually come down. He had a lady patient, aged fifty, wearing an artificial denture, who erupted a canine under the plate.

The President said that the eruption of teeth late in life was not at all exceptional.

Mr. J. Ackery showed models of cases of non-eruption in a family, and briefly mentioned the facts in connection with them. His intention to report the cases was rather suggested by Mr. Van der Pant's case. It was some years ago since he saw the patients, and took the models, which were in some respects rather imperfect. The eldest girl in the family had only two lower incisors; the eye teeth were perfectly regular and normal. The second member of the same family had three lower incisors between the canine. The third daughter had only two incisors, and resembled the case of the eldest girl. The mother at the time said she knew of no peculiarity either in her husband or the family. But being interested, she had since examined her husband's mouth, and found that he had only three lower incisors. As the lady had set him right in the numbering

of the models, and was evidently a more than usually clever and observant woman, Mr. Ackery thought that every reliance might be placed on her statement. With regard to the fact of missing incisors in the lower jaw, the records seemed to be very few, and there seemed to be no such abnormality in the Museum, except in those cases where many of the teeth were absent. As far as the children, whose cases he had cited, were concerned, they had been under his care for some years, so that there was no suspicion of any teeth having been extracted.

Mr. F. J. Van der Pant having asked if there were any peculiarity in the upper jaw,

Mr. Ackery stated there was none, but there was one peculiarity in the lower jaw he might mention, viz., the canines partook of the same character as the incisors.

Mr. F. J. Bennett suggested that a possible explanation of the presence of the canine-like tooth next to the central incisor might be that, from the persistence of the temporary canine, the permanent canine glides into the place of the permanent lateral incisor.

Observations on the Structure and Development of Ovarian Teeth.

By T. Charters White and J. Bland Sutton.

The structure and development of teeth found in ovarian dermoids have not been investigated in a manner commensurate with the interest of the subject. In this communication it is our intention to record a few facts relating to these remarkable teeth. In shape, size and number they seem little influenced by the age of the patient or the proportions of the cyst. Dermoids in the ovaries of children may contain teeth, whilst similar tumours in adult and old women contain none. The age at which teeth develop and erupt in dermoids is independent of the individual's age. In children, five, seven and ten years of age, dermoids have been found with many teeth fully erupted. Recently one of us examined such a tumour, the size of a cricket ball, removed from a girl of seven years; it contained a lock of hair thirty inches long and six erupted teeth, and several others with their crowns still covered by stout membrane. In adults, dermoids are occasionally seen with teeth in the earliest process of development. We are equally unable to make any statement as to

the age at which ovarian teeth are shed. One of us has established the fact that as age advances the hair in dermoids turns grey and is subsequently shed, the cyst becoming literally bald; but an edentulous dermoid, in the sense that the teeth have been shed, has yet to be demonstrated.

The number of teeth in a dermoid varies greatly—in many, probably half, perhaps more, none are detected. When present they are frequently overlooked by the operator and his assistants, hence no reliable statistics are forthcoming. Sometimes two or three teeth are found, in others twenty, and in large multilocular dermoids as many as four hundred have been counted. Such abundance is rare. When the number exceeds twenty, teeth may be described as numerous. As a rule they are embedded in loose bone resembling the alveolar borders of the jaws. Often they project from a flat piece of bone like the heads of nails driven into a piece of wood. In most specimens it seems to us that the bone in which the teeth are socketed is developed subsequent to or concurrently with their development, because in many instances such teeth are lodged in the soft tissues of the tumour, especially when unerupted, and the germs are found unassociated with bone or cartilage. The fang is completed after the eruption of the crown, as is the case with natural teeth. The sockets of these

teeth are lined with periosteum, or as it is more appropriately called, alveolo-dental periosteum.

In dermoids teeth are not scattered through the tumour, but are usually collected in a group, or less frequently in two or more clusters. This congregation of complex structures is very marked. In the specimen sketched in fig. 1 the skin, hair, glands and teeth are confined to a small space: beneath the skin four unerupted crowns

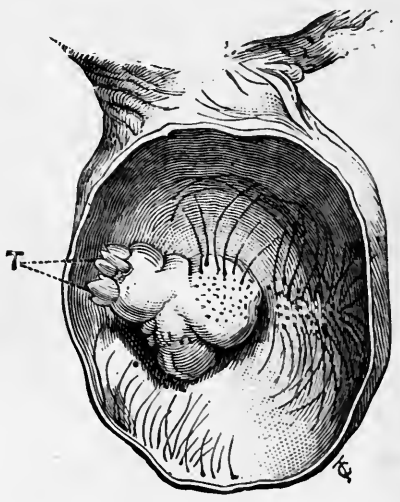


Fig. I. Portion of an ovarian dermoid to shew the congregation of teeth to a limited area.

were found. Mr. Tomes' *Manual of Dental Surgery* (3rd ed.,), contains an excellent example of this "swarming" of teeth upon a small piece of bone from an ovarian dermoid.

In shape ovarian teeth vary greatly. Frequently they resemble supernumerary teeth: some

resemble incisors or canines. Often the crowns are bicuspidate or multicuspidate, and nearly always the fang is single. An ovarian tooth with two fangs is in our experience very rare. From

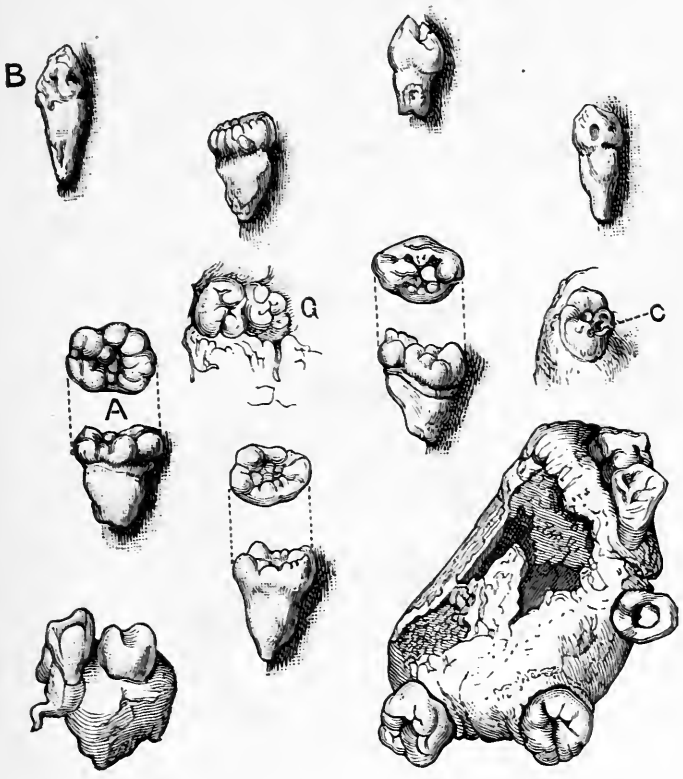


Fig. II. Ovarian teeth: shewing canines, bicuspidate and multicuspidate teeth.

G—A geminated tooth. B—A caniniform tooth.
C—A crown shewing so-called caries. A—Multicuspidate crown.

the comparison of a larger number of these teeth it seems that the crown develops at the expense of the root. Teeth with small crowns possess long roots. Specimens of ovarian teeth are given

in figs. II. and III. Gemination occasionally occurs.

The structure of ovarian teeth has been investigated by Owen* and Salter.† Coleman‡ investigated them from a thoracic dermoid. Salter showed that in some of the long and slender teeth no central chamber was demonstrable; the dentine fibrils in these radiate, as it were, from a central point or line. This we are able to con-

Fig. III. Ovarian teeth.
Side and posterior view of an incisor and a multicuspidate tooth with two fangs.

firm; Coleman also noticed this. We find that in ovarian teeth enamel and dentine are always present; cementum is not so constant. The enamel is lodged upon the crown in lumps, or hummocks, with deep ravines often extending to the dentine. This is well illustrated in Owen's figure. The enamel fibres run in all directions, they are in fact very disorderly arranged: in one

* *Odontography*, p. 468, pl. 124, 1840-45.
† *Guy's Hos. Rep.*, 3rd series, vol. vi. 1860.
‡ *Trans. Odonto Soc.*, 1865.

specimen enamel gradually merged into, and became directly continuous with, bone.

Dentine maintains its normal relation to the enamel and pulp, but near the end of the fang becomes very irregularly disposed and twisted like geological strata after a severe earthquake. The peculiarity known as looped dentine is occasionally seen. Between the dentine and enamel large and conspicuous interglobular spaces exist.

The amount of cementum is variable: in many teeth it is absent. In others it exists only in a very thin layer: in some it may be detected coating only one side of the fang. Although we find the three elements—enamel, dentine and cementum—occupying normal relations to each other, yet the two first elements seem so convulsed in their development that in apparent order all is disorder.

The pulp is very irregular. As has already been noted, many of the bicuspidates, incisors and canines lack a pulp chamber, whilst in multicuspidates it is of fair size (fig. IV.) In many the pulp is converted into osteo-dentine; in others it contains vascular fibrous tissue, the teeth presenting an apical foramen. Often the pulp is full of fat globules.

The existence of nerves in the pulp of ovarian teeth has been demonstrated by Salter in the paper already mentioned, but no one has con-

firmed this important observation. We have devoted particular attention to the anatomy of

Fig. IV. Microscopic characters of a multicuspidate and bicuspidate ovarian tooth.
In A the pulp chamber contains osteo-dentine.
In B the pulp chamber is exceedingly small and occupied with osteo-dentine. Cementum is absent from the fangs.

the pulp, and are able to state that in some specimens the pulp presents the same characters as in

an ordinary tooth; it exhibits connective tissue traversed by blood-vessels in great number; sometimes nerves are present, and in one fortunate section a few large cells are seen lying close to the dentine, occupying the situation, and displaying the usual characters of odontoblasts.

This part of the investigation will receive further attention as suitable material comes to hand. There is nothing remarkable in the existence of nerves in the pulp, for nervous matter has been demonstrated in ovarian dermoids by Henry Gray, 1853, and recently by Neuman, 1889.

A few days ago one of us was fortunate enough to detect nervous matter in an ovarian dermoid. The opposite ovary contained teeth, and these were carefully decalcified and the pulp of one found to contain structures resembling large nerve fibrils. Further, dermoids, in other regions (orbit and back) must contain nerves, for patients can localise the prick of a pin quickly and readily when, from accident or design, the inner walls are exposed. It is also well to bear in mind that ovarian dermoids are often the seat of peculiar pain, and on more than one occasion it has been possible to suggest the nature of the tumour from the character of the pain. We are unaware of any previous attempts to trace the development of ovarian teeth. Recently a specimen came to hand in which we have been enabled to trace their

development, and demonstrate their origin from structures similar to those arising under normal conditions. This part of the investigation is of interest, as it throws unexpected light on one form of supernumerary tooth.

In dermoids, loose rounded bodies not unlike sugar-coated pill, or the boiled lens of a fish's eye, are occasionally found. These bodies are composed of cells, and are named epithelial pearls. Such a pearl is shewn in section and *in situ*, fig. V.; the cells are large, but become compressed as they approach the peripheral part of the pearl, and finally become lost in the environing capsule. In the same section we can study their mode of origin as ingrowths from the surface epithelium, which gradually becomes isolated in the surrounding tissues. After their enclosure such pearls may increase in size from growth of the enclosed cells; the lens in our eye grows in a similar manner.

The epithelial pearls are worthy close study, for they are allied to enamel organs—indeed, they may be regarded as enamel organs, for in fig. VI. one of these is shewn descending like an avalanche upon a dental papilla beneath. In fig. V. we see one enveloping the head of a papilla like a normal enamel-germ, and remaining connected by means of a neck with the free surface of the loculus from which it arose. Many of

these germs lack a definite follicular wall; this may possibly explain the deficiency and occa-

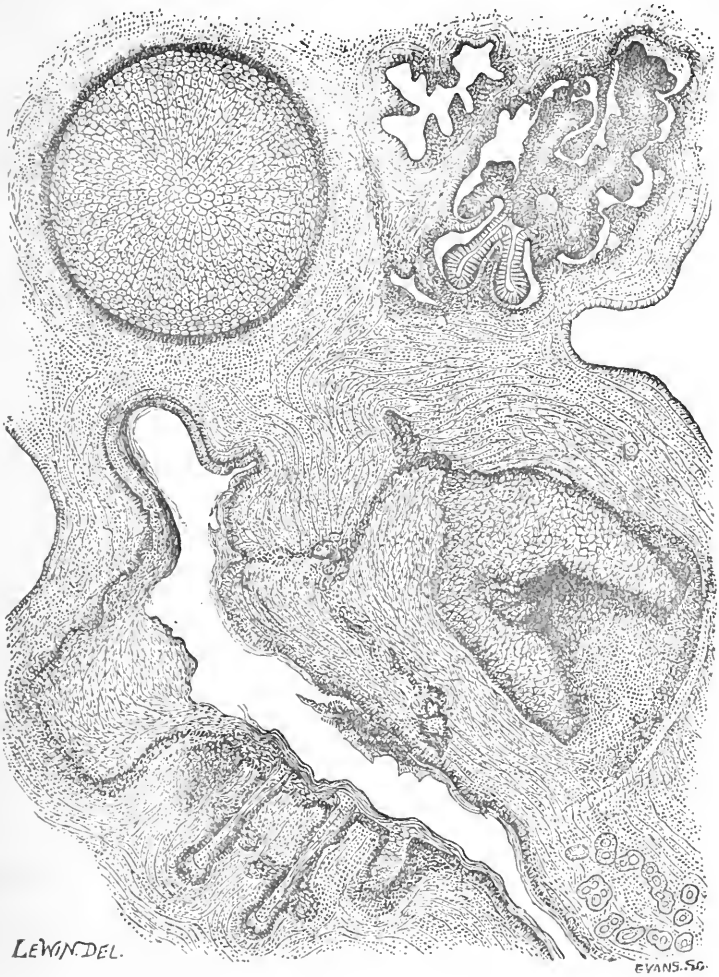


Fig. V. Compound section of ovarian dermoid shewing epithelial pearl and developing tooth (from *Trans. Obstet. Soc.*, 1889).

sional absence of cementum to the fang. As yet we have not succeeded in detecting any evidence of germs of secondary teeth; this may be

owing to the limited opportunities of examining the developmental stages of ovarian teeth.

It is remarkable that these pearls may remain cellular or give rise to enamel. In some dermoids they undergo transformation into horn or nail.

The relationship of epithelial pearls and enamel

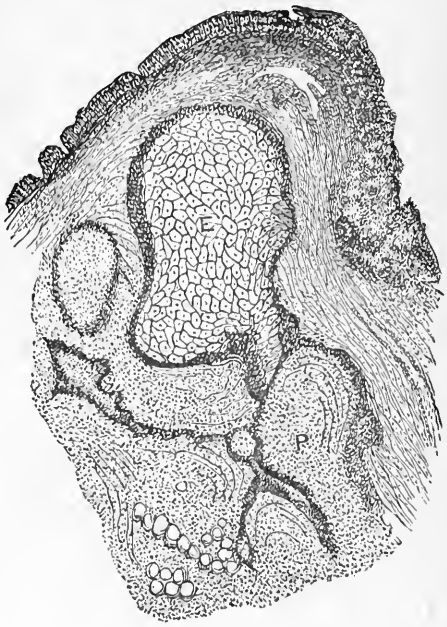


Fig. VI. Germ of an ovarian tooth.
E.—Enamel organ. P.—Dentine papilla.

organs is of interest in another direction. The pearls have been most closely studied in the median line of the hard and soft palate, that is, in the line of confluence of two epithelial covered structures. As a rule they are small in size, but occasionally act as tumour germs and give rise to

neoplasms known as palatine adenomata. It has recently been pointed out that such pearls are occasionally associated with papillæ in the meso-palatine suture and give rise to a not uncommon phenomenon, viz., a meso-palatine tooth. As epithelial pearls are found in the neighbourhood of the gums, they may account for some forms of supernumerary teeth beside the meso-palatine variety. Some of these pearls have been described as remnants of the gubernaculum. This is possible, and may account for their irregular shape and diminutive size.

A study of ovarian teeth is instructive in another way. It has on more than one occasion been stated that they are liable to caries, but no reliable evidence, and what would be infinitely more valuable, no specimens, are forthcoming. Occasionally an ovarian tooth is seen with a small cavity in its crown communicating in some cases with the pulp (fig. II.,) but these cavities have only been seen in macerated teeth. Such cavities are capable of explanation without invoking aid from caries. We have pointed out that the enamel on the crowns is hummocky, and the cleft between the hummocks extends to the dentine. These clefts are usually filled with fibrous tissue, hence, when the specimens are macerated, the soft tissue decays away, leaving a channel, or opening. We are of opinion that a carious tooth has yet to be demonstrated.

In conclusion, we may point out that much remains to be investigated in connection with ovarian teeth, and especially in regard to their characters when occurring in the ovaries of other mammals. It has long been known that such tumours in sheep contain wool; in horses hair; and in pigs bristles. In birds they are said to contain feathers. It would be interesting to ascertain if in tooth-bearing dermoids in these mammals the type of teeth is a mimicry of those characteristic of the particular mammal in which the dermoid occurs.

Addendum.

By Mr. T. Charters White.

In 1863 Mr. Alfred Coleman read a very interesting paper before this Society on Cystic Tumours, in which he dealt very widely with the various tumours affecting the maxillary region particularly. In the course of this paper he reported on ovarian tumours and their contents, and where in the various hospital museums specimens could be seen. He then proceeded to speak of the forms of the ovarian teeth he had met with, and their histological characters, but had examined too few to enter to any great extent into this subject. A microscopical examination of some ovarian teeth, carried out in conjunction with Mr. J. Bland

Sutton, may advance our knowledge of the form and histology of these abnormalities, certainly in the direction of confirming Mr. Coleman's careful observations, while the thoroughness of Mr. Bland Sutton's work will considerably add to our information relative to their nature. This contribution of mine can only be regarded in the light of a report added as a supplement to his paper, and as the result of a careful examination of hard sections with the view of ascertaining the nature of the various histological elements entering into the constitution of ovarian teeth. The most convenient order in which to report on these conditions is by commencing with their macroscopical features. The forms kindly supplied to me could be assigned to the molars and bicuspids, but were not of that form usually presented to us by normally developed teeth. The molars were stunted in their growth and finished abruptly at their necks in some cases, while in others the root extended as a single *tap* root brought suddenly to a close. The most striking feature about the molars was their well-pronounced and numerous cusps standing up like nipples on what we should in an ordinary tooth call the masticating surface —the cusps separated from each other by deep fissures. The bicuspids might in many specimens have been taken for malformed canines with the same form of root as that already described as

appertaining to the molars. The apical foramina were in some cases quite absent, while in other specimens they were left widely open, even in some to the entire width of the neck of the tooth. The enamel presented a sodden appearance, and was not of that smooth character usually met with, and moreover was perforated with holes resembling those met with in worm-eaten wood. So much then for the external appearance of these teeth. Some were then slit open with a diamond disc on the dental engine, no great difficulty even being presented by cutting them through with a wet piercing saw on account of the friability and want of cohesion in the enamel fibres. On inspecting such a section it was seen that the perforations before noticed on the enamel entered and traversed the enamel in tortuous tubes as if bored by some annelid. The granularity of the enamel which enabled the teeth to be sawn in two proved a barrier to grinding the sections to any great degree of thinness, but it was better to have a view of the enamel and its character in an imperfectly ground section than losing it altogether in vain attempts to grind it thin, for that would have ended in its suddenly disappearing into powder. By an examination of such hard sections as I was enabled to make we shall be in a position to observe the three histological elements contained in ovarian teeth.

The enamel prisms presented every degree of granularity and were frequently marked with those cross striations usually found in imperfectly developed enamel, while the prisms themselves twisted and twirled about in every conceivable direction. The junction of the enamel with the dentine frequently presented a fringed appearance from the irregular prolongations of wide and distorted dentinal tubuli into its base. In one specimen a portion of the enamel was wanting, while the hiatus was filled up by true bone with its lacunæ and canaliculi; on the opposite side of the section the bone again occurs, but so gradually fused with the enamel fibres that it is difficult to tell where one ends and the other begins. It is perhaps in the dentine we observe the most marked irregularity and the definite departure from the usually staid appearance of that tissue. The dentinal tubuli are there, but they seem to have followed no definite course for long, for suddenly they will curve off the course and become developed in a most turbulent appearance, frequently terminating in wide, irregularly-shaped cavities, or becoming looped in a prominent manner with some of their neighbours, or invading the enamel as before mentioned. The dentine in these teeth afford an abundant display of interglobular spaces not exactly of the character usually seen in globular dentine, but smaller and

more generally scattered throughout its substance, while large and irregularly-shaped lacunæ are frequently met with filled by sarcous tissue which readily takes a stain, as may be seen in some of the specimens on the table. The cementum has been small in quantity in the specimens I have examined, and presented no features calling for notice.

In many teeth the extraordinary absence of a pulp cavity, and consequently of the dentine-forming organ, is a fact worth calling attention to. In the teeth I have been examining the cavity has been present, but in all cases but two the pulp was wanting, as the teeth were not recent, the two I allude to were recent, but the pulp very small and fragmentary, but I was enabled to partially harden and cut sections from them. The first thing brought under my notice very prominently was the large size of the vessels as compared with the delicate capillaries of a normal pulp—these were very large, with well-defined coats and decided branches. No nerve fibres were discerned in these specimens. The stroma throughout which they were distributed was coarser and more open than is found in general and properly developed teeth. Each of the smaller recent teeth for which I was indebted to Mr. Bland Sutton was enclosed in a close, tough, fibrous cyst, which had to be opened and removed

and the tooth shelled out. I did not notice anything peculiar in this structure worth mentioning. In bringing my brief and perhaps bald report to a close I can only sum up the results of the examination of these very interesting teeth by saying that in my opinion it would be a useless waste of time to enter into a lengthy description of irregularities of structure which are not constant, because, however accurately you may describe the histological irregularities of one tooth, the examination of the next may give you appearances of a totally different irregularity, and thus it would be impossible to formulate any definite description of tissues so aberrant as those of ovarian teeth.

Discussion.

Mr. Arthur Underwood said that he rose with very great diffidence because he would honestly confess that he came with a very open mind, but still he thought it would be unfair to so able and carefully-prepared a paper to allow it to pass without at least some kind of attempted comment. In the first place it would be generally recognised that Mr. Bland Sutton and Mr. Charters White had thrown a great deal of fresh light upon their subject, and he was of opinion that their paper would form a classic upon the subject. He was not aware that any literature they had now dealt at all fully with the questions taken up in the paper. Recently he came upon a case published in a Boston journal; it was a careful description of teeth lodged in two bones which resemble the parietal bones separated from each other by a suture. The teeth were called simply molars and bicuspids, but they did not seem to Mr. Underwood to be anything of this plain description. He would be happy to give Mr. Bland Sutton the reference to the case if he desired. His next point was in connection with Mr. Sutton's remark that he did not believe there was any recorded instance of ovarian teeth with more than one fang. Although it was a dangerous thing to suggest that Mr. Sutton was possibly in error, but it seemed to Mr. Underwood that the specimen No. 994 which Mr. Sutton had passed round had two fangs at the top; possibly if the bone were chipped away it might prove not to be so. Another point was with reference to epithelial pearls: possibly Mr. Bland Sutton was not aware of some interesting researches from the pen of a Frenchman who discussed these formations at great length and endeavoured to prove that at times they were abnormal teeth and at other times they were tumours. With regard to the disorder of the tissues: it was obviously present, and he thought such disorder was always present in an abortive

attempt to form a tooth. It was present when the pulp forgets to do its natural work and endeavours to form secondary dentine. When there were secondary teeth made they were always of a disordered kind. Of course Mr. Bland Sutton was careful to cut the particular section illustrated through the centre of the tooth, though it looked from the drawing as if it might be a little off the pulp. He would be glad if Mr. Sutton would put them in the way of obtaining such specimens as were exhibited. He (Mr. Underwood) would for his part promise to cut them, examine them, and report upon them. In conclusion, he thought the Society would be able to do greater justice to the paper later on.

Mr. Charters White, as the author of the section referred to, replied he might say he was careful to cut it as near the median line as possible with a diamond disc and a dental engine. He must say that he very much regretted that he was unable to get more than two sections out of one tooth, therefore he cut each tooth into two sections and he ground them down pretty flat and polished so that he thought that they had obtained one side of the median line. Transverse sections had not at present been obtained, but he hoped to get them when more specimens were procurable.

Mr. Storer Bennett thought the Society was to be congratulated upon the extremely able paper to which they had listened; and as this was the first occasion that Mr. Bland Sutton had been out after a severe illness, they would take it as a very great compliment that he had come down to deliver the paper himself. Mr. Bennett was exceedingly interested in hearing Mr. Sutton's remarks as to enamel being deficient on the crowns of teeth, reminding them of the fissures that were to be seen in molars and bicuspids. Mr. Sutton said that at the bottom of these fissures there was fibrous tissue. Now on the authority of Charles Tomes it was known that these fissures were often filled by Nasmyth's membrane, and it was very remarkable, as Mr. Sutton had pointed out, that cementum was either not present or was exceedingly thin, and that instead of cementum or Nasmyth's membrane there should be in the case of ovarian teeth fibrous tissue.

Mr. George Cunningham (Cambridge) simply rose for the purpose of asking a question, viz., whether any caries had been found in the teeth in these cysts. His reason for asking the question was, that at Buda Pesth he saw a cyst of the same nature containing carious teeth. His impression from noticing Mr. Bland Sutton's specimen was that caries was present in the various kinds of teeth.

Mr. Charters White remarked a casual observer might very often mistake some of the foramina for caries. They were brown and corroded, no polish at all on the surface, and they seemed to be eaten into by holes, more like worm holes than anything else, but with perfectly defined borders.

Mr. W. A. Maggs asked for information as to the condition of the multilocular cysts and the formation of multicuspidate teeth since they seemed altogether exceptional.

Mr. F. J. Bennett said that Mr. Sutton's paper induced speculation in the absence of any apparent rational cause for certain departures from the usual course. With reference to calcification Mr. Sutton had stated, and Mr. Charters White had also given it the weight of his authority, that there was no pulp cavity in some of the teeth from which the sections were taken. If they looked at the nodules of secondary calcification found occupying the pulp cavity of old teeth, the formation seemed to begin from a central spot and to increase by layers deposited one upon another from within outwards or centrifugally. Might not these teeth, so eccentric in many ways, develop in a somewhat similar manner, and precisely in an opposite direction to that of normal primary dentine, which calcified from without inwards? It would seem probable some unusual arrangement existed, as Mr. Sutton had said that in many of the teeth there was no cementum, or only in a very rudimentary form indeed. Mr. Bennett remarked that in Sir Richard Owen's "Odontography," published many years ago, there was a description and a fine litho of an ovarian tooth.

Mr. Bland Sutton replying, said he was extremely indebted to Mr. Arthur Underwood, and should be glad to be favoured with the references to the papers he mentioned.

He might say, as to the tooth having a bifid fang, that upon looking at it again, he thought Mr. Underwood was probably right. He (Mr. Sutton) had examined many hundreds of these teeth for bifurcated roots without finding them, that at last he supposed he must have got careless; but it was a point that he would take the earliest opportunity of putting beyond dispute. Should Mr. Underwood's view be correct, it would only modify the paper to the extent of stating that bifurcated roots were "of the greatest rarity" instead of that "they were unknown." Now with reference to caries, although he had intentionally excluded the subject in delivering the paper, it had in reality been included in the paper which had been prepared by Mr. Charters White and himself. Caries in ovarian teeth had not been demonstrated. These ravines in teeth always contained fibrous tissue. Caries in ovarian dermoids, in the sense employed for buccal teeth, had yet to be demonstrated. With reference to Mr. F. J. Bennett's remarks, it was a curious thing that both Coleman and Salter had noticed that dentine radiates from the line rather than the pulp chamber. However, it showed the value of bringing a question of that sort before a Society instead of writing the subject up in one's study, and packing it off to a journal. In threshing a subject out before a Society, many valuable suggestions were often made in the course of discussion. With reference to Mr. Magg's question, he would say that any number of teeth over twenty or fifty in these cysts was most rare. The dermoid before them was most exceptional. There was nothing peculiar about the teeth, but it would not be wise to draw any conclusion from them. In conclusion, he wished to say that the discussion had been a most profitable one to him.

Votes of Thanks.

The President said it afforded him a great deal of pleasure to offer the thanks of the Society to Mr. Bland Sutton and Mr. Charters White for their most interesting, able, and suggestive paper. They were all greatly rejoiced to see Mr. Sutton restored to health again, for had the illness been fatal, it would have been a loss not only to their Society, but to the whole scientific world. The next meeting would be on the 14th of April, when they would have a contribution from Mr. Henry Sewill on "Some Points in the Etiology and Pathology of Dental Caries," illustrated by photo-micrographs of the tissues shown upon a screen by Mr. Andrew Pringle. There would also be a casual communication from Mr. Scott Thomson on "Splicing Engine Cords."

The meeting then separated.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

April 14th, 1890.

MR. FELIX WEISS, L.D.S.,

PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

Mr. JAMES H. REINHARDT, L.D.S.I., signed the Obligation Book, and was formally admitted a member by the President.

The LIBRARIAN (Mr. ASHLEY GIBBINGS) stated that he had received the usual periodicals. He had also received a number of invitations for Members of the Society to attend the forthcoming International Medical Congress to be held in August at Berlin, together with copies of the rules and sectional programmes.

The CURATOR (Mr. STORER BENNETT) said that he had received from Mr. C. Robbins, for the Museum, the skull of a rabbit which had been injured during life in such a manner that the lower incisors had become greatly overgrown, while the upper ones from non-use had been also excessively developed, the left one having been deflected to the right side so that it crossed the middle line, and,

causing absorption, the tip had become imbedded in the hard palate on the right side.

Mr. Robbins had also sent for exhibition the skull of another rabbit kindly lent by the Editor of the *Field*, in which the right lower maxilla presented an un-united fracture, which had produced a very similar overgrowth of the incisors, both upper and lower, with a perforation of the hard palate on the right side by the left upper incisor. The right upper incisor was also interesting from having been previously fractured and united.

Mr. Redman had presented a supernumerary tooth removed from the space normally occupied by the left upper incisor, the tooth was much stunted and the apex of the fang presented the appearance of being invaginated into the crown.

Mr. Henry Sewill had presented eight microscopical slides of sections of teeth, chiefly representing various phases of caries, many showing stained micro-organisms very beautifully. He had also sent seventeen photo-micrographs illustrating the subject of his paper that evening.

The PRESIDENT said the Society must feel very grateful for the donations which the Librarian and Curator had just mentioned, and he hoped they would express their thanks to the donors. He then called upon Mr. Scott Thomson for his casual communication, remarking that it would be best to take the discussion upon the "Casuals" all together after the last one.

Mr. SCOTT THOMSON demonstrated a splice for dental engine bands. He said that the difficulty experienced by many in making a satisfactory join, especially with the cord used for the Bonwill engine, would, he hoped, be a sufficient apology for bringing before the Society a method which was not original and which had appeared in a recent number of the *International Dental Review*. Taking first the S. S. White driving band, which consists of a plaited sheath without a core, the necessary length is measured and about five inches extra allowed for the splice. A needle is required

which may be constructed by doubling upon itself a piece of piano wire and fastening the ends in an excavator socket-handle with pewter solder. In order to facilitate the description the respective ends of the core will be called A and B.

First: pass the needle unloaded through the meshes of the sheath four and a-half inches from end A, then along the inside for a distance of two inches and out again. Second: thread end B, which has been slightly unravelled, in needle, and withdraw through sheath, leaving half-an-inch projecting. Third: pass needle in a similar manner four and a-half inches from end B, and out again at the exact place where B has been ensheathed in A. Fourth: end A is threaded in needle and withdrawn. Fifth: both projecting ends are cut off and cord pulled firmly, when cut ends disappear inside the sheath. Where a round cord with a core is used, such as with the Bonwill engine, the cord is cut out for the exact length of the desired splice, which, if carefully made, will not be easily detected. No stitching is necessary, as the greater the tension of the band the firmer the splice holds.

Mr. Maggs then read notes of a case of defective development of the permanent teeth, associated with malformation of eyes and anus. Models of the patient's dentition were shown. (See woodcut.)

Rose S., aged eighteen years, was admitted into Guy's Hospital under the care of Mr. Brailey, for chronic glaucoma of both eyes.

Family History.—She is the eldest of six children, and her grandmother states that she is a full-term child. Her three brothers died in infancy from convulsions; her two sisters, aged respectively seventeen and thirteen, are living and well; the father is in good health, aged about forty-one; the mother died of consumption at the age of thirty-seven.

Present Condition.—The patient is of medium height and dark complexion, with fairly developed head and face. Her hair is dark in colour, full in quantity, and fine in texture. The eyebrows and amount of hair on the body are

normal, and there is some hair on the upper lip; her nails are well developed. She seems very slow mentally. Her anus was imperforate at birth, and had to be established by operation.

Dental Notes.—In the upper jaw there are one temporary and six permanent teeth. All the incisors and permanent molars are absent; but one temporary molar remains between the premolars on the right side. There is absence of the alveolar process between the canines. The palate is flat. *In the lower jaw* there are ten teeth. *On the right side* the incisors, second premolar, and the wisdom tooth are absent, but a caniniform supernumerary tooth is pre-

sent between the canine and premolar. *On the left side* the canine, second premolar, and the wisdom tooth are absent.

Ophthalmic Notes.—Mr. Brailey has favoured me with the following notes relative to her eyes :—Each eye is very deficient in size (microphthalmos). There is almost complete absence of irides, but the lenses are present, as ascertained by oblique illumination. Each eye has thirteen dioptrics of myopia, as ascertained by keratoscopy. This myopia is not improved by spherical glasses. The ophthalmoscope shows the discs to be small. There is no coloboma of choroid, but a few patches of opaque nerve fibres are seen in the retina. Vision is defective in each eye. Mr. Brailey finds nothing suggestive of specific disease.

Remarks.—The patient asserts that she has never had any teeth in the front of the mouth. There is some difficulty in naming several of the teeth, especially the two lower ones on the right side of the median line, and the last tooth on each side of the upper jaw. The canine teeth are peculiarly peg-shaped, whilst the upper teeth that I have named second premolars have two distinct cusps on the outer masticating surfaces, and simulate molars. There is a general tendency to dwarfing of the teeth, which are well covered with enamel, and free from caries. The interest of the case centres chiefly in the fact that the teeth and eyes, which are mainly dermal organs, are malformed, the teeth being, in addition, defective in number. It is further interesting in that the nether portion of the alimentary canal, the anus, also of epiblastic origin, was imperforate.

The case was brought before the Society mainly as an association of congenital defects of organs derived from the same embryonic layer, viz., the epiblast.

Mr. Barrett showed a home-made electric lamp. He explained that this consisted essentially of a sixteen volt incandescent lamp, behind which was a reflector, and in front of which was a convex lens. These were mounted upon a wooden base, 8in. by 3in. in size, and were enclosed in a copper tube. The lamp, thus constructed, was placed upon a swinging arm, to which it was attached by a ball and socket joint The power was derived from a storage

battery. The advantages possessed by this lamp over that which was placed within the patient's mouth lay in the absence of a light to dazzle the operator, and in the freedom allowed of using his left hand. Mr. Barrett also showed an artificial fulcrum of vulcanite which enabled him readily to extract with an elevator the stump of a difficult lower wisdom tooth. The first and second molars on the same side were absent, and a previous attempt with the elevator and forceps had failed. A small vulcanite side-piece was then constructed to a model of the lower jaw, and, being held firmly *in situ* by a lower bicuspid tooth, which it embraced, it proved a perfectly steady and rigid fulcrum when the elevator was again employed.

The PRESIDENT then called upon

Mr. HENRY SEWILL, who said that although he had spoken and written about dental caries perhaps more than most men in the Society, he was ashamed to say it was only in recent times he had made a thorough research into the nature of the disease. He did not think he would have undertaken the work now had he not been fortunate enough to secure the co-operation of Mr. Pound, of King's College, who was an expert of experts in bacteriology. Mr. Sewill had a large number of sections now, more beautiful he believed than had ever before been prepared, and this had been an inducement for bringing before the Society a subject upon which he had nothing new to tell them. Another inducement was, that he had been fortunate enough to interest Mr. Andrew Pringle, whose reputation as a physiologist and photomicrographist was well known. If he (Mr. Sewill) were to stop to express his obligation to every scientist to whom he was indebted his list would be a long one, but he would especially mention Mr. Arthur Underwood, Mr. Charters White, and Mr. Charles Tomes. Mr. Sewill particularly dwelt upon the value of Mr. Underwood's work. The facts which he published in 1881 were all fully confirmed by Mr. Sewill.

The following slides were then exhibited, Mr. Sewill commenting upon them as they were shown :—

Slide 1.—A section of developing tooth of a cat, by Mr. Charters White; magnification 160 diameters on the slide, and 5,120 on the screen. Examination of the process of tooth development demonstrated that the nutrient supply of enamel came from the vessels of the dental sac. The dentine commenced to be calcified before the enamel, and except the external supply there was no vascular supply nearer than the dentinal pulp, and this was cut off by the mass of dentine. It was difficult to imagine the nutrition of the enamel pulp from the dentinal.

Slide 2.—A section of developing dog's teeth, prepared and stained by Mr. Arthur Underwood; magnification on the slide 240 diameters, on the screen 7,680. Enamel cells forming enamel, dentine and odontoblasts were all clearly visible.

Slide 3.—Section of enamel organ; 650 diameters on the slide, and 21,000 on the screen. Forming enamel, enamel pulp, and external enamel cells, all well defined.

Slide 4.—Section of odontoblast layer and developing dentine. Slide, × 650, on screen, × 21,000.

Slide 5.—A section of enamel, by Mr. Arthur Underwood, stained with chloride of gold. This was an exceedingly good section and a good photograph. × 650; and on screen × 21,000.

Slide 6.—Section of dentine stained with carmine, by Mr. Arthur Underwood; magnified 650 diameters on the slide, and 21,000 on the screen. Showing the point of junction with enamel, into which tissue some tubes could be seen to run.

Slide 7.—Transverse section of dentine, unstained, by Mr. Charters White; × 650 on slide, × 21,000 on screen.

Mr. Sewill said he had expressed shame that it was only lately he had investigated the pathology of caries thoroughly, but the shame he felt was mitigated by the fact that he held now, and had always held, that on anatomical grounds alone it was impossible to accept any explanation of the pathology of caries different from that which had been propounded by all modern authorities having valid claim to that title. All observers,

though they might differ in some small details, had come to the conclusion that caries was entirely due to external agents and quite devoid of any true pathological phenomena.

There was not the least doubt in Mr. Sewill's own mind that to imagine the presence in enamel of any physiological elements capable of pathological action was quite absurd. Protoplasm could not live isolated; it must be nourished. The physical characters of enamel, the absence within it of demonstrable organic matter beyond a trace, the impossibility of imagining physiological activity in the calcareous basis of such a tissue, and the difficulty in believing in conveyance of nutrient and waste matters to and fro by the dentinal fibrils—these and many other such facts negatived the hypothesis.

Slide 8.—Section from a tooth unaffected by caries showing inherent structural defect in enamel, by Mr. Charters White. Magnification, 150 diameters on the slide, and 7,800 on the screen. Granular enamel plainly seen, and a crack in part of it. This tooth to the naked eye presented no defect.

Slide 9.—A section of enamel showing inherent flaw, a fissure and granular-tissue from a tooth free from decay and presenting no naked eye appearances of defect. Same × as No. 8.

Slide 10.—Section of tooth showing inherent defect—globular dentine extending in strata beneath the enamel, alternately with well-formed tissue; × 80 on slide, 2,560 on screen. Mr. Sewill said that, when expressing his opinion based upon anatomical grounds, he had not been unmindful of the researches of Gallippe and Hoppe-Seyler, who had tried to prove that teeth gained in density as age advanced. The only way to prove that teeth gained in density would be to cut sections from the same tooth at different periods of its existence, but even then the result would be very fallacious, as was proved by the sections just shown, since the density of both enamel and dentine varied very much at different parts of the same tooth, and teeth in the same set were usually of very variable density. The

study of inherently defective enamel and dentine largely explained the etiology of dental caries. It largely explained the incidence of the disease, and the extreme variability in its rate of progression in different cases.

Slide 11.—A typical section of the orifice of a cavity illustrating caries proper, magnified 80 diameters on slide and 2,560 on screen. Mr. Sewill remarked that Mr. Pound had in the course of the investigation cut and stained some eight dozen sections. Care had been taken to cut a large number from teeth the pulps of which had been long dead; the appearances were the same as in living teeth without exception; in every case the dentinal tubes were found filled with organisms. Quite recently he (Mr. Sewill) had met with a lady having a carious re-inserted natural tooth. Mr. Pound had cut a considerable number of sections from this tooth, and caries was shown to be absolutely the same in it as in a living organ; some of these sections were shown under the microscope that evening. Mr. Sewill further stated he had received from Professor Miller of Berlin a series of slides illustrating caries artificially produced out of the mouth identical with that produced in the mouth. Several of the slides of artificial and natural caries had been mixed, and Mr. Arthur Underwood and Mr. Pound and he himself had endeavoured to separate them, but none of them had been successful. In essential points the artificial was identical with natural caries. Mr. Underwood had noticed some specimens in which organisms although on the surface were not in the tubes; and Mr. Pound had pointed to the fact that bacterium termo and torula seemed more plentiful in artificial than natural caries. Of the bacteria present in caries the micrococcus is the most frequent. They are found in groups, pairs and chains. Dr. Miller says the pairs and chains are agents of lactic acid fermentation. Leptothrix is found in all cases, especially on the surfaces. Bacteria proper—rods of varied length —are found everywhere. Torula, one of the true fermentation organisms, was present, but not in great quantities, particularly on the surface among food *débris* and also in the tubes. Bacilli, commas, also spirilla and spirachæta were common in all parts.

Slide 12.—A deeper section of the same tooth as slide 11, magnified 160 diameters on the slide, and about 4,480 on the screen, showing the organisms penetrating along the tubes.

Slide 13.—A thinner section than the last, magnified 650 on the slide, 20,000 diameters on the screen. Point of junction of healthy and carious dentine. In this the micrococci could be seen forming pairs, groups, and chains. This section to the naked eye would look healthy.

Slide 14.—A section of about the most advanced caries possible to cut a section of, magnified 650 diameters on the slide, and 21,000 on the screen. Tubes mainly occupied by cocci, but other varieties also present.

Slide 15.—A beautiful specimen showing tubes mainly filled with leptothrix. Why it so often happened that one organism was more abundant than another it was difficult to say. This section was magnified 20,000 diameters on the screen.

Slide 16.—A transverse section of carious dentine; magnification of photograph 650 diameters, 21,000 on screen. The tubes in this case were mainly filled with leptothrix.

Slide 17.—Photograph of scrapings of carious tooth; comma bacilli, rods, a bundle of leptothrix, micrococci and various organisms. This was a comparatively easy preparation to make. It was merely necessary to scrape the surface and stain a portion.

Slide 18.—Section of "pipe stem" appearance, etching out of the tissue by acid. This and the so-called zone round the area of caries was once thought to indicate vital reaction in dentine, but it occurred in dead teeth; it was simply due to softening of the dentine. It was not necessary to multiply specimens; those shown were typical of the different phases of caries. He hoped that a great many other individuals would go into the research of caries. It was really so simple that he did not see why students in every school should not go through the whole process.

There were a vast number of demonstrated and demonstrable facts; in the first place there were anatomical facts which negatived the possibility of pathological action in

enamel and dentine; there were the facts connected with predisposing causes—existence of inherent structural defects in the tissues; the fact that agents exist in the mouth capable of destroying dentine and enamel; the fact that caries is the same in teeth with living pulps and pulpless teeth. Then there was the fact that in teeth replaced in the mouth on plates caries occurs showing tissue changes absolutely identical with living teeth; and lastly the fact that caries can be produced in extracted teeth artificially indistinguishable from that which occurs in the mouth.

The method of staining adopted by Mr. Pound was that of Gram, with some modifications. Mr. Sewill would shortly publish a full account of this, as well as of the method of preparing and cutting sections which had been employed.

The PRESIDENT said it would be impossible to conceive anything more perfect than the specimens of Mr. Pringle's photographs which Mr. Sewill had shown, he (the President) had never seen anything so perfect.

Mr. CHARTERS WHITE said that from the way in which Mr. Sewill's communication had been received it was evident that the Society thoroughly appreciated the work he had done, supplemented so ably by Mr. Andrew Pringle, who was *facile princeps* in photo-micrography. In the early days of dental pathology he (Mr. White) was inclined to adopt the view that the origin of caries was found within, *i.e.* through a vital and physiological process, for there were one or two points upon which his opinion was based at the time which convinced him that dental caries arose from within, as well as from without, but in later years he had come to Mr. Sewill's conclusion, that caries is due to external agencies in all cases, for if dental caries originated from within, it would very often, if not always, be found that a cavity existed in the dentine, far removed from the external surfaces of the enamel, but that was not the case. Once he thought he had discovered a cavity below the enamel, but on careful examination, he found it originated from a cavity in the enamel itself, which he had overlooked. He thought

that the conditions they had seen photographed and shown on the screen, such as granular enamel, subjected the teeth to the attack of micro-organisms; once let such a condition be established on the enamel and the work proceeds by a sort of fermentation in the line of the tissues; the cavity becomes enlarged, micrococci multiply, and as yeast ferments, so they ferment until the dentine is exposed. These views were understood by everyone, so that he did not pretend to be stating anything original, but he had made these remarks rather for the purpose of supporting the opinions of Mr. Sewill, with which he agreed.

Mr. F. J. Bennett thought that Mr. Sewill's delightful paper had been of the utmost service, not because it contained anything new—indeed, the absence of anything new made discussion, if not impossible, at least unnecessary. But it was a great advantage for them to be able to see, by means of such pictures as Mr. Sewill had been able to obtain by the assistance of Mr. Pound and Mr. Pringle, the facts demonstrated upon which the opinions as to the etiology of dental caries rested. Mr. Sewill had so freely acknowledged the sources to which he was indebted in the course of his investigations, that he felt sure that he (Mr. Sewill) would be glad to be reminded that with the name of Mr. Arthur Underwood, who has done so much, should always be associated the name of Mr. Milles, who had so ably worked in the same field. He felt sure that Mr. Underwood himself would be pained if his name were divorced from that of Mr. W. T. Milles.

Mr. Sewill, in reply, thanked Mr. Bennett for drawing his attention to the most unintentional omission of Mr. Milles' name in connection with Mr. Underwood's work on dental caries. He added that he hoped to prosecute his research further, and with the assistance of improved methods to arrive at definite results.

Votes of Thanks.

The President, having given the usual votes of thanks to the readers of communications, announced that the next meeting would take place on May 5th, when a paper would be read by Mr. J. Howard Mummery on "Some Points in the Preparation of Microscopical Sections of Teeth," illustrated by the lantern; casual communications by Mr. Thos. G. Read on a "Method of Crowning using a Model," and by Mr. Harry Baldwin on a "Case of Hyperostosis of the Upper Jaw."

The Meeting then adjourned.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

May 5th, 1890.

MR. FELIX WEISS, L.D.S.,

PRESIDENT, IN THE CHAIR.

THE Minutes of the preceding meeting having been read and confirmed,

Mr. R. DENISON PEDLEY, M.R.C.S., L.D.S., signed the Obligation Book, and was formally admitted a Member of the Society by the President.

Messrs. CHARLES FREDERICK RILOT, M.R.C.S., L.R.C.P., L.D.S.Eng., 44, Gloucester Place, Portman Square, W.; J. O. BUTCHER, L.D.S.Eng., 26, Harley Street, W.; JOHN GREENFIELD, L.D.S.Eng., 11, Brook Street, Hanover Square; ROBERT WYNNE ROUW, M.R.C.S.Eng., L.R.C.P. Lond., L.D.S.Eng., 65, Harley Street, W.; JAMES FRANK COLYER, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng., Hazeldene, Thurlow Park Road, West Dulwich; were balloted for and elected resident Members of the Society.

The LIBRARIAN (Mr. ASHLEY GIBBINGS) stated he had received a book and a pamphlet from Professor Guiseppi Cali, of Naples, on "The Pathology, Therapeutics, and Hygiene of the Mouth and Teeth" (*Sulla Patologia Terapia*

ed Igiene del Vestibolo della Bocca e dei Denti), also "The Year Book of the Scientific Societies" and "Il Policlinico," a new periodical published at Turin.

The PRESIDENT then called upon Mr. T. G. Read to read his communication on "A Method of Making an all Gold Crown, illustrating a convenient way of Obtaining and Using a Model."

A suitable model is most useful when crowning bicuspids and molars, and in some cases incisors and canines.

The method to be described is, in my opinion, less painful than those ordinarily practised; a great part of the work is done in the absence of the patient; the metal band of the crown is roughly adapted to the stump, and feather-edged previous to fitting in the mouth; the portion passing under the gum is the same relative distance beneath it around the stump, and a very perfect occluding surface is obtained. When about to crown a stump, first, if possible, adjust the rubber-dam and fill the pulp canals, then reduce the broken-down crown in height to allow for restoration of the occluding surface, the stump being left standing as high as possible above the gum. Should much tooth tissue have to be cut away, and especially where the adjacent teeth are close, a long file cut fissure bur with a chisel point is very useful; two holes are drilled with the point from the labial to the lingual surface, one at the mesial, the other at the distal part of the crown; the tooth substance between these holes is cut away with the fissure part of the drill, then one blade of a pair of excising forceps is placed in the labial and the other in the lingual opening, the handles are pressed together and the crown comes away.

Small pieces of upstanding tooth substance close against another tooth may be readily removed with a wheel bur, such as Dr. Horatio C. Meriam's; these projections can be cut off from the inside without wounding the gum, and the unpleasantness of running a corundum wheel in the mouth is avoided.

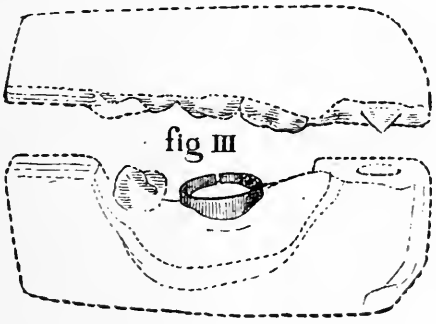
Now make the sides of the stump as far as the band is to extend quite parallel, so that the crown may fit the

stump closely and tightly like the lid of a tin canister (fig. 1). Previous to paring the stump, cocaine in the crystals is rubbed on the gums with the finger, then by a drawing to and scraping motion with Dr. Daniel F. Whitten's broken back, and Dr. Bennett's Nos. 5 and 6 chisels, the enamel and overhanging, or projecting tissue of the stump, is stripped off. The sides of the stump,

fig I

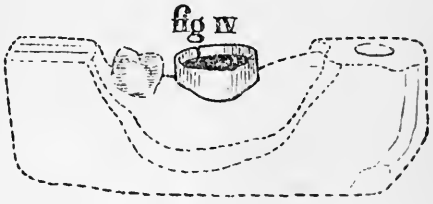
fig II

having been pared quite parallel, should be finished smooth by carefully passing a safety point shouldered, fine file cut fissure bur around it. Take a strip of thin metal, telephone plate answers well, trim and bend this to the stump; when roughly fitted press a small piece of softened composition to the band and stump, the patient then closes the mouth, biting into the composition; as soon as it is hard remove the impression and little band from the mouth (fig. 2).

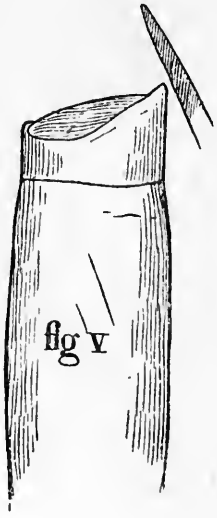


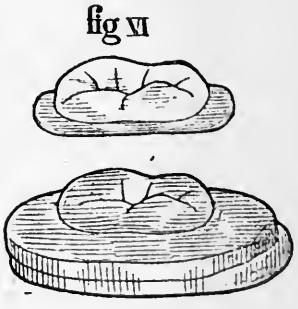
Cast a lower and upper model from this with the little band *in situ*, now you have the occluding and adjacent teeth and the stump with the little band on, showing the position of the gum edge around it (fig. 3). Over this band make the metal band of the crown in coin gold (size 5) to

fit it and correspond to the gum edge—the join should be at the lingual surface (fig. 4). Having fitted the band to the model, soften the end of a stick of composition and press the band on with the edge to go under the gum uppermost, this is feather-edged with a fine round file (fig. 5).



Take a piece of coin gold of the same substance as the band, and in Messrs. S. S. White's die plate strike up cusps for the crown (fig. 6). Try the struck up cusps to the occluding model and see if the bite will ride. Mark where





it will, place the cusps on the male die of soft metal used to strike them up, and with blunt punches knock down those places marked; the articulating surface is thus made perfect (fig. 7).

File up some solder and mix it with a little Parr's flux, fill the interior of the cusps rather full and flow the solder over a bunsen flame. Now see the patient, and fine fit the band on the stump, when this is accomplished solder it edge to edge over a bunsen flame, using binding wire as a clamp (fig. 8).

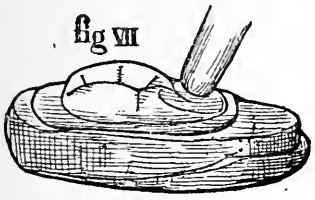


fig VII

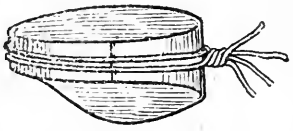


fig VIII

Then with contouring pliers contour the band. If the canals have not been filled twist a piece of binding wire with a bead or two upon it, round the contoured band, place this on the stump and use it to hold the rubber-dam. Soften the end of a stick of composition, and press the band upon it with the occluding edge uppermost, with a fine flat file,

fig IX

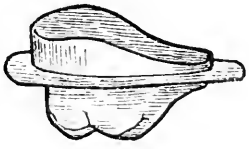


fig X

cut the surface flat, remove the band from the composition, and try it and the cusps in the mouth, removing and replacing it upon the stick to cut away until the cusps are let in and the occlusion is perfect (fig. 9).

Now place the cusps upon a soldering gridiron, borax

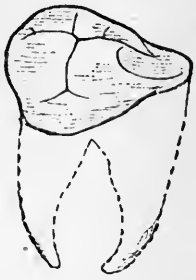
the edge of the band, and adjust it in position on the cusps, so that when the shoulder that is on the cusps is cut away the buccal and anterior surfaces will be perfect; hold the work over a bunsen flame, and the solder in the cusps will melt and unite with the band (fig. 10).

When soldered, if the lingual and posterior surfaces are not perfect, build them up with coin gold scraps and solder filings, run the solder with a blow pipe (fig. 11).

Boil in acid, trim with a fine corundum wheel and polish, having the crown on a stick of composition. Horizontally groove the pulp chamber, dry it out, and fill it and the interior of the crown (fig. 12) with oxyphosphate of a

fig XI

fig XII



creamy consistency, press the crown on the stump with a notched tooth-brush handle.

Strike the tooth-brush handle once or twice with a lead mallet to expel any surplus of cement. When the setting is hard trim away any excess of cement with a broken back chisel. The mallet is only used in the final stage, as the band can always, if properly made, be pressed on the stump with the finger.

Mr. Walter H. Coffin remarked that in reading a communication with the rapidity that the one they had just listened to had been given to the meeting, it was quite possible to overlook some points. The only new point which he had been able to see was the fitting a base metal immediately, and adapting around that the permanent gold crown, which would of course be too large, and then have to be closed up in the mouth and soldered. It seemed to

Mr. Coffin that the fitting of the permanent gold crown on the stump could be accomplished in the first instance as easily as in any other metal; he imagined, however, that Mr. Read found it more convenient to handle some other metal in the initial stage.

Mr. Read said the telephone plate band is not fitted to a nicety, but only roughly. It could be done in about three minutes. Then the band is cast in an impression, and an assistant could get the gum edge right. One advantage was that an assistant could do the work which would otherwise have to be done by the practitioner. Then the point was to get the gum edge right. In the specimen he had passed it is very shallow on one edge and deep on the other. It would be very difficult to make it in any other way.

Mr. Harry Baldwin then read the notes of a case of Hyperostosis of the Upper Jaw. He said:—The case to which I desire to call attention is that of a woman aged thirty-nine, unmarried, the greater part of whose upper jaw was affected by a chronic bony enlargement. There is nothing in the family history to account for it. Both parents are alive, and, I should say, unusually healthy. There is no history of any constitutional taint as far back as the family can be traced, viz., to the great-grandparents, excepting that one of the mother's brothers, —one out of a large family—died of consumption. The patient has a sister, however, who is at the present time suffering from malignant tumour of abdominal viscera.

The case has been under my observation at different times during the space of the last eight years. At the commencement of that period I had occasion to examine the mouth with reference to a small plate the patient was wearing. At that time the condition of the mouth was as follows:—The patient was wearing a partial upper plate of silver, carrying the two central incisors and the first bicuspid on each side. The right canine and right second bicuspid were still standing and healthy. The plate was attached by a wire to the right second bicuspid. The

stumps of the left canine and lateral incisor were present. The rest of the upper jaw was edentulous. The left alveolar process in the molar region was considerably enlarged. The portion containing the two stumps was also considerably enlarged, the portion corresponding to the missing right lateral incisor slightly. All these enlargements were seated on the outer side of the alveolar process, but the largest one—that occupying the molar region on the left side—extended a good deal downwards as well as outwards. All the enlargements were painless, rounded with ill-defined edges, quite hard on pressure, and covered with thin, pale, smooth gum quite healthy in appearance. The patient was unaware of anything wrong. At this time I formed the opinion that an operation would eventually become necessary.

During the next four years the condition remained practically the same; the masses enlarged slightly. At about the end of this period I extracted the two stumps, which came out easily, and gave the sensation of being implanted in something more soft and succulent than normal. Observation of the case some time afterwards gave me the impression that extraction of the stumps had rather stimulated that portion of the growth which had immediate relation with them.

During the next three years the various enlargements gradually increased in size.

During the next year, which was the seventh from the commencement of my observations, the growth made considerably more headway, and the mucous membrane over the enlargements became pencilled over with small superficial blue veins, which ran up on the labial surface vertically. The more rapid increase, and the appearance of the blue veins, which I interpreted as showing greater activity of circulation, made me decide upon operation for the removal of the growths at an early date.

Mr. Pearce Gould now saw the case and kindly consented to admit the patient into Middlesex Hospital and operate at once.

The condition of the mouth at this time was:—The

lower jaw was perfectly healthy. Of the lower teeth only the front ones were remaining, and the edentulous alveolar process behind them on each side showed rather more absorption than is usual. The upper jaw still presented the two teeth, right canine and right second bicuspid, firmly implanted and healthy.

The alveolar process of the upper jaw behind the right second bicuspid was normal. The remainder of the alveolar processes presented a general enlargement, chiefly in an outward direction and downwards, but the enlargement was much more marked in the situations corresponding to the three primary enlargements first noticed, and at another spot, viz., in the incisor fossa at the root of the nose.

The swellings were all still rounded and ill-defined, especially where they joined the bodies of the maxillary bones and malar process. The largest mass, that occupying the molar region on the left side, measured vertically from its lower margin to a line drawn through the top of the concavity of palate, one-and-a-quarter inches. Its general breadth at the base also measured about one-and-a-quarter inches. This mass impinged on the shrunken edentulous gum of the corresponding part of the lower jaw when the mouth was closed.

The mucous membrane was still perfectly healthy, except the blue veins. The lips and cheeks corresponding to the growths were markedly bulged out, and the enlargements near the front of the mouth were plainly visible to the observer when the patient opened the mouth to speak.

The nasal processes of the superior maxillary bones up to the inner angle of the eye were more prominent than is usual, though the patient assures me they had always been so, and the whole middle portion of the face was more prominent than is usual, giving the patient a decidedly plain appearance; but this appearance dated, at any rate, from many years before I had the case under observation.

We could not arrive at a decided opinion whether this was a case of exostosis or hyperostosis. It was evidently a bony tumour by its hardness, and could not be malignant because of its slow and painless progress, absence of cachexia, absence of enlarged glands, &c.

Permit me here to observe that exostosis of the jaws, along with the other facial and the cranial bones, is almost always of the dense ivory-like variety, and is formed by layer after layer of bone being deposited in an outward direction by the periosteum.

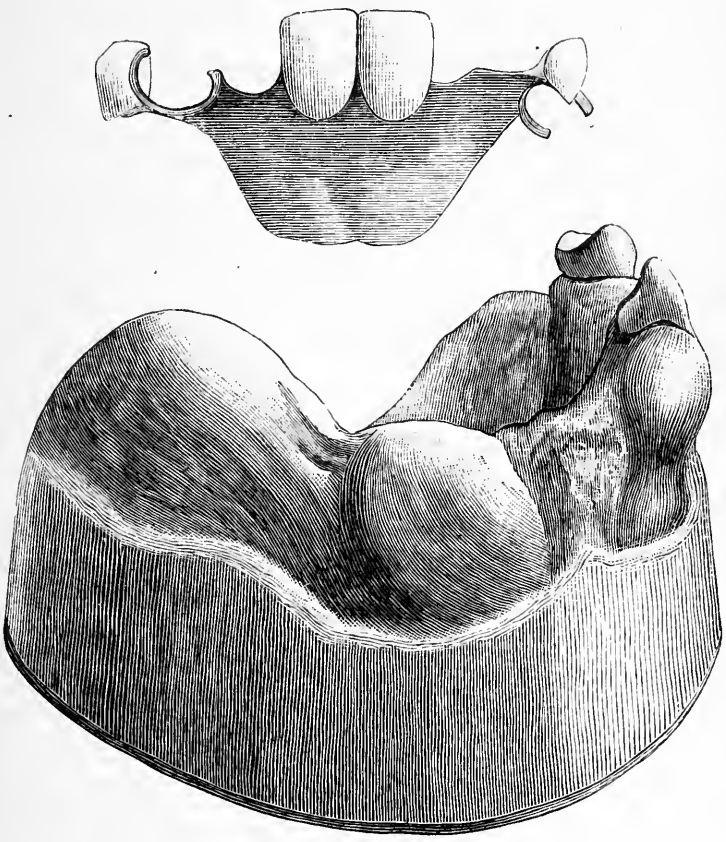
Hyperostosis, I take it, signifies an enlargement of a bone generally, where the whole bone, or parts of it, are bulged, and constantly grow bigger without that regular deposit of layers of compact bone by the periosteum, which is characteristic of ivory exostosis, and without deposit of cancellous bone by a superficial layer of cartilage, which is characteristic of spongy exostosis.

If the tumour in question turned out to be a case of exostosis it would probably be ivory-like in density, and exceedingly difficult to remove. To meet this contingency I had an extra strong head and fittings made to a Bonwill engine—driving large pointed spear-drills, long and short, large fissure and rounded burs, long and short, and a circular saw.

Mr. Gould on undertaking the case kindly agreed to call upon me to use my engine and drills if needed. The operation was performed at Middlesex Hospital on December 14th, 1889. The patient was put under chloroform. Mr. Gould then made an incision along the whole edge of the growth through the gum, and separated it from the bone with a raspatory. He proceeded with bone-cutting forceps, and at once found the tumour to consist of perfectly spongy bone quite easy to remove. The masses were then cut away piece-meal with the forceps. The two remaining teeth were removed by the bone-cutters, together with the portions of growth in which their roots were imbedded. The hæmorrhage from the spongy bone was very free indeed, but was comparatively easily stopped by firm pressure with sponges. The flaps of gum were brought together and retained by several sutures. The operation lasted about one-and-a-quarter hours. Afterwards the patient felt very little pain or inconvenience—indeed she affirms she felt no after-pain whatever—and left the hospital at the end of a week with the gums to all ap-

pearances healed. The models show the condition before and after operation.

he further history of this case will be highly interesting, as showing, first, whether the growth is permanently checked; or, secondly, whether it is only a first instalment, so to speak, of a general overgrowth of facial bones, or



leontiasis, which ultimately produces frightful deformity, attacking one bone after another and becoming entirely beyond treatment; thirdly, whether a plate with artificial teeth upon it will be tolerated and worn with good effect.

The unfavourable elements in the case are—first, the undefined character of the base of the tumour, which rendered the entire removal of the enlarged bone absolutely impossible, especially at the root of the nose and left

malar process. Secondly, the doubtfully significant protrusion of the nasal processes of the superior maxillary bones, and the very chronic prominence of the middle portion of the face, which, as I have indicated, may be a forerunner of leontiasis.

The naked-eye inspection of the bone which was removed showed it to be cancellous throughout, with large spaces scattered here and there, which had so globular a form, and were lined by so smooth and shining a membrane as, I think, to justify their being called small cysts.

The sections under the microscope are taken through the canine tooth and the portion of growth adjacent to it. The growth is seen to consist of an irregular network of bone, the interspaces of which are occupied in two ways. First, some of the interspaces are filled by soft tissue consisting of white fibres and cells. The cells are fairly numerous in parts, are branched and contain large deeply-stained nuclei. Secondly, the remaining interspaces are lined by a thin fibrous membrane and present an actual space. These, I take it, were filled with fluid during life, and correspond to the large cavities which were plainly visible to the naked eye in the larger portions of the growth.

Sufficient time has not yet elapsed since the operation to say decidedly whether any further enlargement of the bone has taken place.

One of the most interesting features of the case lies in the fact that the pressure of the artificial teeth had not by any means initiated or irritated the growth; but, wherever they rested, had positively exercised a most marked influence in preventing it. Those parts of the alveolar process where the four porcelain teeth rested, viz., the region of the two upper central incisors and first upper bicuspid on each side, were for years perfectly free from the growth when it had attacked nearly all the intervening parts, and up to the last were far less affected than the intervals where no pressure was exerted.

The PRESIDENT then called upon Mr. J. Howard Mummery to read his paper.

Notes on the Preparation of Microscopical Sections of Teeth and Bone.

By J. Howard Mummery, M.R.C.S., L.D.S.

Mr. President and Gentlemen,—My communication to the Society to-night will be chiefly of a technical nature, but I think it may be interesting to many members to introduce to them a method of preparing sections of teeth and bone which has not been generally in use in this country, and which may prove of considerable service in studying the histology and pathology of the teeth.

I also propose to exhibit on the screen some photographs of specimens prepared in this way, demonstrating certain points in dental structure, which it especially well brings out. We have all of us gone through the tedious process of cutting dry sections of teeth, and found it, in a measure, unsatisfactory, for we have the tissue in a dried-up condition, having procured, in fact, but the preparation of a skeleton—the soft parts having entirely disappeared, and the relations of the dentine and cementum to the pulp and peridental membrane being entirely lost.

Although such dry sections are instructive,

there is a sharp limit to their usefulness, and some other method must be resorted to if we wish to study the relations of the pulp, and its odontoblast layer, to the formed dentine, and of the cells and tissue of the peridental membrane to the cementum.

Prior to the commencement of calcification, of course the ordinary methods employed in the histological study of the soft tissues of the body, are fully available, but when calcification has commenced, the unequal degree of hardness of the tissues renders the ordinary method useless.

To study a developing tooth in which calcification has commenced, it is necessary to decalcify the portion already impregnated with lime salts; to remove these latter by the action of an acid.

Although much has been, and can be done with these decalcified specimens, they also have serious drawbacks.

It is very difficult to cut sections of these preparations with the microtome, without displacing the decalcified tissue from the pulp and peridental membrane; a few happy specimens only, among a large number of sections, exhibiting the soft parts in contact with the dentine and cementum, and we rarely procure a very thin section available for the higher powers of the microscope by this method. But there are other drawbacks to the process—we do not know ex-

actly what alterations may be produced by the acid employed, both in the decalcified portion and in the cell elements.

As pointed out by Dr. Black in his work on *The Periosteum and Peridental Membrane*, the action of the acids "is injurious in a large degree, and robs the tissues of that freshness so necessary to the gaining of good views of their constituents." He also points out that the finer chemical relations of the tissues, rendering them susceptible to delicate stains, are often disturbed by the acids used, and selective staining rendered impossible.

Being struck with the imperfections of the usual methods of preparing tooth sections, and disappointed with my own results, I was interested by a suggestion made to me by Mr. Tomes some two years ago.

Professor Moseley of Oxford had mentioned to him a plan of hardening sections of teeth and bone by gradually increasing strengths of alcohol, and then impregnating them gradually with a solution of dried Canada balsam in chloroform, but giving no detailed account of the process.

In the *Journal of the Royal Microscopical Society* for December, 1888 (p. 1042), an extract was published from the *Zeitschrift für Wissenschaftliche Mikroskopie*, giving a detailed method of carrying out this balsam process by Dr. L. A. Weil.

I prepared some sections according to these directions, and was so pleased with the results that I have since cut nearly two hundred specimens in this way. By employing this process no decalcification is required, and the cells and connective tissue of the pulp and also of the peridental membrane are retained in their natural relations to the hard tissues.

To quote from the extract in the Microscopical Society's *Journal*:—

"Dr. L. A. Weil takes only fresh, or nearly fresh teeth, and in order to allow reagents and stains to penetrate into the pulp cavity, divides the tooth immediately after extraction with a sharp fret saw, below the neck, into two or three pieces, allowing water to trickle over it the while."

To procure longitudinal sections it is advisable to cut them a little to one side of the pulp cavity, just opening this enough to enable stains to penetrate.

"The pieces are then laid in concentrated sublimate solution to fix the soft parts." The advantage of the sublimate appears to be due to its coagulating the albumen of the tissues—it certainly seems to be very efficacious in preventing shrinkage.

"The sections are then washed in running water for about an hour, and placed in 30 per

cent. spirit for twelve hours, and for a corresponding period in 50 per cent. and in 70 per cent. spirit.

"To remove the black sublimate precipitate the teeth are then laid for twelve hours in 90 per cent. spirit, to which 1·5 to 2·0 per cent. of tincture of iodine has been added. The iodine is removed by immersion in absolute alcohol until the teeth become white.

"They are now ready for staining, and the stain which Dr. Weil recommends is borax carmine (alcoholic or aqueous solutions). After being washed for fifteen to thirty minutes in running water, they are left in the stain for two or three days; they are then transferred to acidulated 70 per cent. spirit (70 per cent. spirit, 100 ccm., muriatic acid 1 cm.), in which they remain—the watery stained ones at least twelve, the alcoholic stained ones twenty-four to thirty-six, hours. They are then immersed for fifteen minutes in 90 per cent. spirit and then for half-an-hour in absolute alcohol, after which they are transferred to some etherial oil for twelve or more hours.

"The etherial oil is quickly washed off with pure zylol, and they are placed for twenty-four hours in pure chloroform; after this they are passed into a solution of balsam in chloroform.

"This balsam is prepared by drying in a water bath heated gradually up to 90° C. for

eight hours or more, until when cold the balsam will crack like glass on being punctured."

Much trouble may be saved by procuring this desiccated balsam ready prepared.

"The sections are allowed to lie for twenty-four hours in a thin solution of this dried balsam in chloroform, and then as much balsam is added as the chloroform will take up. The sections covered with the balsam solution are then placed in a suitable receptacle over a water bath, kept at 90° C., and this cooking kept up until the mass of balsam, with the teeth in, cracks like glass when cold. This requires two or three days.

"Thin pieces are then cut from them with a sharp fret saw, under water, and they are then ground down" (first on a corundum wheel, afterwards on a stone) "in the usual manner."

My most successful sections have been ground down on a washita stone, using a piece of cork, or the finger, and plenty of water.

The *débris* can be very conveniently washed off the completed section with a fine spray of water blown through an ether spray apparatus. The section is then mounted in chloroform balsam.

The process, as detailed, no doubt appears very tedious and complicated, and it is almost enough to deter anyone who has but little leisure

from undertaking it, but when a number of sections are being prepared in different stages, the passing on from one solution to another does not occupy much time.

Wolrab's gold bottles in a rack form excellent receptacles for the sections, a note being made on a label on the bottle, of the stage they have reached.

With this, as with most other processes, there are of course a good many failures, some being caused by insufficient cooking, the pulp not being sufficiently hardened; too prolonged cooking, on the other hand, is apt to cause brittleness.

The cutting down is certainly very tedious and must be done on a slow cutting stone; rapid cutting, as with a turkey stone, I found resulted in the pulp being crowded with small particles of the stone, which adhere firmly to the balsam, and I know of no means of getting rid of them.

Of course, too, without great care, in grinding very thin sections the pulp may break away at the last moment, and it is only by practice one can learn to avoid this annoying accident.

The stain recommended by Dr. Weil—borax carmine—penetrates well, and stains the nuclei very strongly, but does not give so much detail in the pulp as some other stains. Very good results may be obtained with aniline blue black, which stains the nerve fibres as well as the

nuclei and connective tissue. I have not been very successful with hæmatoxylin, but am told that Erlich's hæmatoxylin, which does not precipitate, would probably be the best stain to use in this process.

I must here express my indebtedness to Mr. Theodore Harris for the great help he has given me in preparing these sections; his assistance has been invaluable in carrying through most carefully the tedious preliminary processes.

The teeth I have made use of have been chiefly young bicuspids, some with the apex of the root still incomplete—extracted for regulating purposes, and I take this opportunity of thanking several friends who have sent me specimens.

I have also made sections of older teeth for comparison, and of some carious teeth and abscesses. In these latter I think the process might prove very useful—enabling one to study the early stages of abscess formation.

Mr. Swift has been kind enough to attend with his projection microscope, by means of which he will be able to project upon the screen the actual preparation on the stage of the microscope. With this instrument we are limited to low-power objectives, as with higher powers there would be too great a diminution of light.

The transparencies presently to be shown are necessary to exhibit the *details* of the speci-

mens, but the slides now shown with a one-and-a-half inch objective, will serve to indicate some of the advantages of the process—as the retention of the pulp in its natural relations to the dentine, and the absorbent cells in temporary teeth occupying the excavations in the tissue, and in the slide showing the rat's molars, it will demonstrate that without decalcification we can exhibit the teeth in their natural relations to the surrounding bone.

The slide showing a longitudinal section of a molar tooth, which has been the subject of severe attrition, shows a secondary deposit in the pulp, surrounded by a transparent zone in the dentine, opposite the surface which has been exposed to the greatest wear.

The transparency No. 1. shows a transverse section of the pulp of a bicuspid tooth. It exhibits the pulp with its relations to the walls of the pulp cavity apparently undisturbed. The odontoblast layer is seen (very distinctly differentiated from the rest of the pulp) lying in immediate contact with the semi-calcified portion of the dentine—the tissue "on the borderland of calcification," that part of the matrix which has evidently undergone some change, in advance of the line of complete calcification. The blood-vessels are seen in transverse section, and also the slightly denser condition of the

central part of the pulp, noticeable in many of these specimens. (Plate I., Fig. 1.)

The next slide from a similar pulp, is interesting as showing, in the large blood-vessels in the centre, what very delicate tissue can be retained in position by the hardened balsam during the process of grinding.

The next slide shows a portion of the pulp and the forming dentine, taken with a half-inch objective and magnified eighty diameters. A blood-vessel is involved in the line of odontoblasts; the semi-calcified portion of the dentine is well seen, and the rounded masses of the lime salts marking the line of complete calcification. (Plate II., Fig. 1.) These rounded masses are still better seen in the next slide, from a longitudinal section at the margin of the pulp cavity —the coalescence of the globules to form the fully calcified tissue being very clearly shown. (Plate III., Fig. 1.)

The next photograph shows a transverse section from one of the cornua of the pulp of a bicuspid tooth, showing chiefly connective tissue and small cell nuclei, and apparently no true odontoblast layer.

The next slide is taken from a tooth which was extracted before the apex of the root was completed. The portion photographed is close to the open end. (Plate II., Fig. 2.)

The odontoblast cells, which, together with their nuclei, have taken the stain deeply, are seen not to be lying in close contact, but to have distinct spaces between them. I do not think this is due to shrinking in preparation, as I have found it in all the open-ended bicuspid teeth I have examined, and other specimens prepared by this process seem to indicate that there is no appreciable shrinkage of the odontoblast cell. Mr. Hopewell Smith, in a paper published in the *Dental Record* for August, 1889, speaking of the dentine after the commencement of calcification, says:—"Between some of the cells of the membrana eboris there are wide visible spaces, filled with homogeneous substance and small round and angular cells." Mr. Tomes also appears to have somewhat modified his views on this point, for whereas in the earlier editions of his "Dental Anatomy" he says (p. 159, second edition)—"The odontoblasts are fitted closely together, and there is no room for any other tissue between them so long as the formation of dentine is actively going on;" in the third edition the words are—"There is not much room for any other tissue between them" (third edition, p. 169). The squareness of the cells towards the forming dentine is very evident in this specimen.

The next slides show the applicability of this

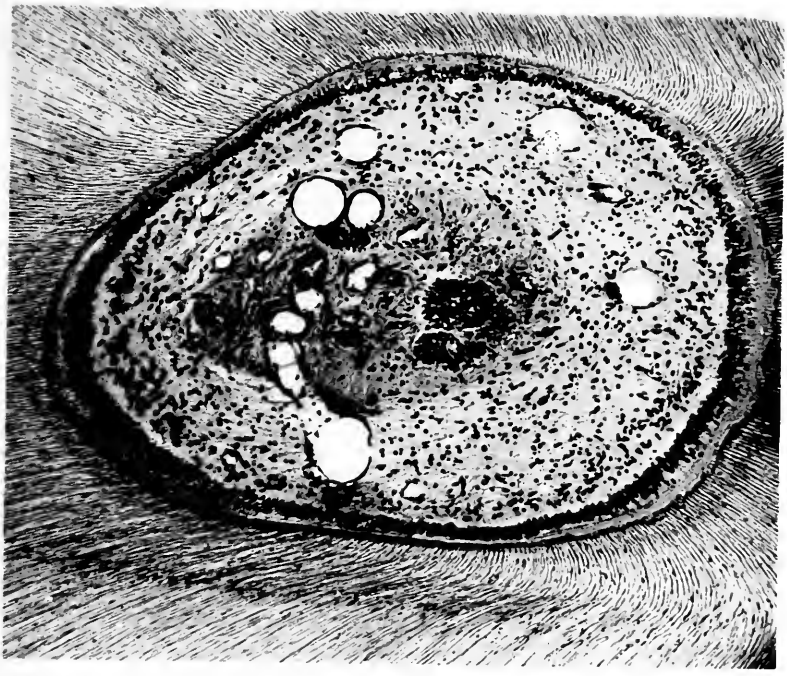
process to the study of the peridental membrane. This photograph, taken with a one-sixteenth Powell and Leland, × 500, is from the margin of the cementum in a transverse section of a bicuspid tooth, stained with aniline blue black. The outer and more recently formed portion of the cementum has taken the stain strongly, and exhibits with great clearness the penetrating fibres of Sharpey,—connective tissue fibres from the peridental membrane passing deeply into the hard tissue, which in this portion seems to be chiefly made up of them. Between these bundles of fibres, where they enter the cementum, are seen the large cementoblast cells concerned in the formation of the tissue.

Dr. Black ("Periosteum and Peridental Membrane," p. 102) describes these cells as being always flattened, with one of their flat sides resting upon the cementum, and of very irregular outline, and considers that in ordinary sections we only see a profile view of them. Their true shape is, he considers, seen in sections of the peridental membrane taken parallel to the surface of the cementum.

The appearances presented by some specimens I have prepared by this process indicate something in the development of dentine not quite in keeping with the ordinary views.

There appear to be processes of the connec-

Fig. 1.



×80.

Fig. 2.

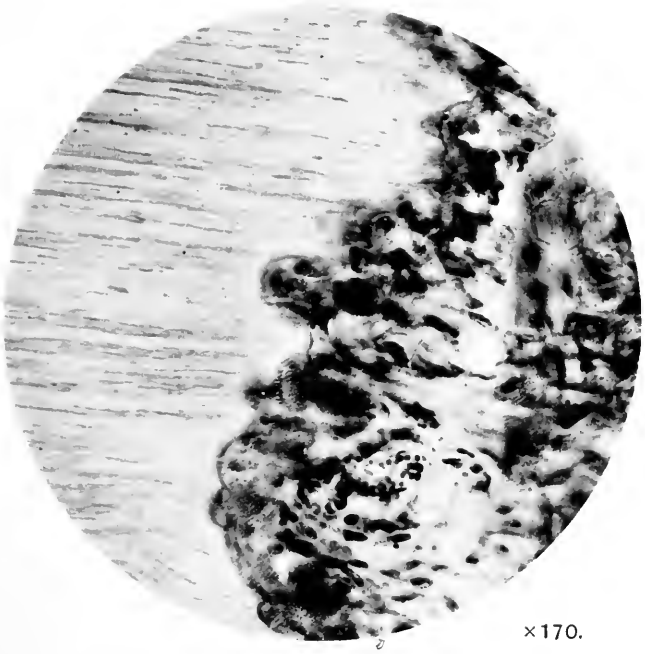


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PLATE II.

Fig. 1.

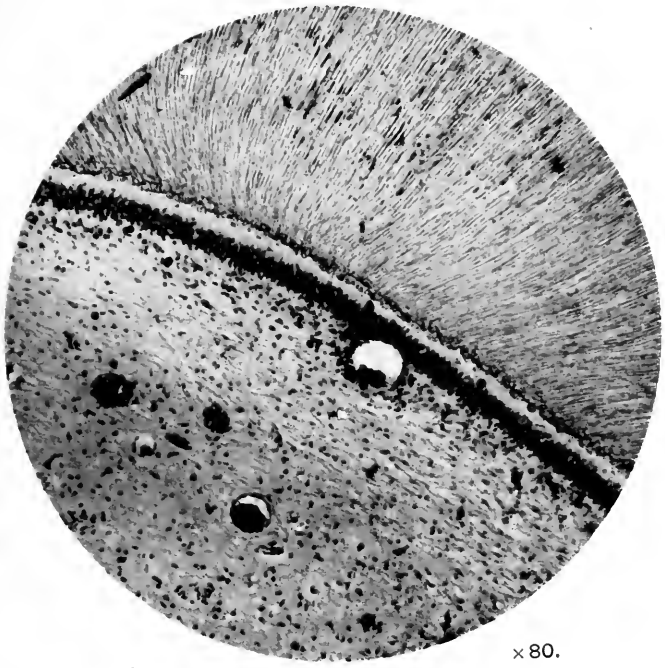

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Fig. 2.

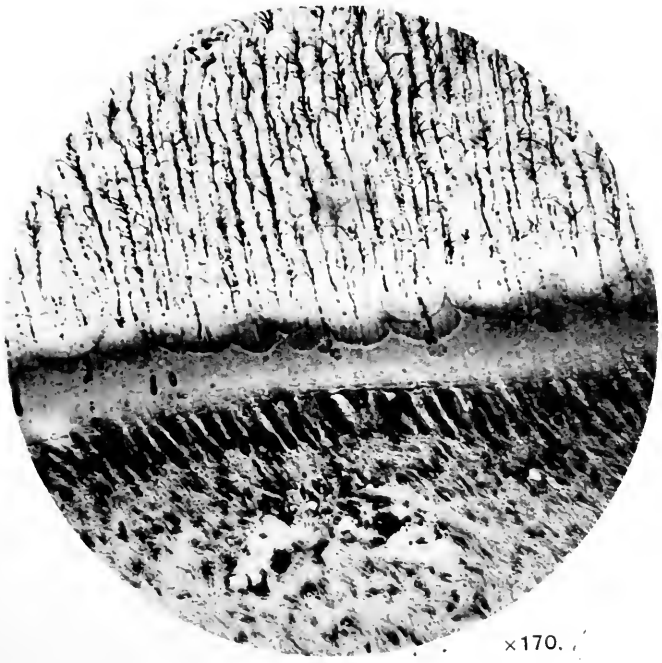

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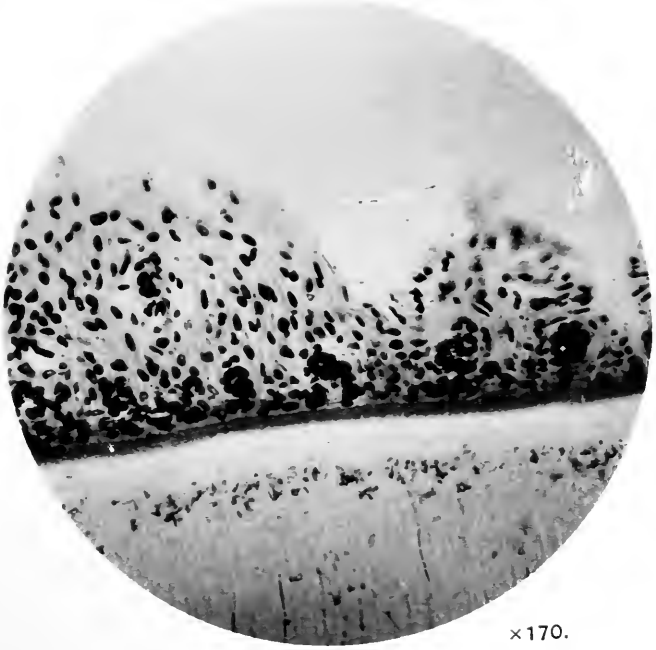
PLATE III.

Fig. 1.

×170.

Fig. 2.



×170.

tive tissue of the pulp, adherent to the dentine, very like the penetrating fibres of Sharpey in bone. I have not yet completed my observations on this point, being at present engaged in investigating other varieties of dentine for this purpose.

In the next photograph (Plate III., Fig. 2) also from a transverse section of a bicuspid, a line of little nests of round cells is seen lying among the fibres of the peridental membrane. These agglomerations of cells lie at a little distance from the surface of the cementum, and are usually seen in young teeth, when the sections are sufficiently thin. They vary considerably in size and in the number of cells composing them. Dr. Black considers them to be lymphatics; he describes them as being more numerous near the margin of the gum, and in sections of the peridental membrane, which he has cut parallel to the surface of the cementum, at such a distance as to include them, he finds that these apparently isolated bodies are connected by a network. The groups of cells seem to be enveloped in a very delicate limiting membrane, which is, I think, visible in the next slide (taken with a one-sixteenth objective, × 500). He looks upon this structure as "lymph canals packed with lymphoid cells," rather than as true lymphatic glands.

In a case of suppurative pericementitis he found the suppuration running along the lines of these lymphatic chains to a great distance, suggesting that this tissue may be the seat of the disease.

Malassez does not consider them to be lymphatics, but the remnants of the enamel organ which extended beyond the region of forming enamel in the early stages of development.

We will now pass to some examples of absorption. The next slide shows a temporary molar in longitudinal section, with the absorbent organ *in situ*—the cells filling up the excavations in the dentine. Magnified 170 diameters. This preparation shows, perhaps almost better than any other, the advantages of the process I have described. (Plate I., Fig. 2.)

It is very difficult by ordinary methods to obtain a thin section of dentine with these absorbing cells in position, such preparations being usually quite fragmentary and the result of happy accidents. It appears to show plainly that the gradual increase in the strength of the alcohol and the preliminary coagulation with the sublimate solution prevents shrinking, as these cells completely fill the lacunæ or excavations in the dentine. This was one of the first preparations I made in this manner, and I have looked upon it as one of the test slides of the process.

In the parts of this preparation where the groups of cells are prolonged deeply into the dentine, the individual cells are large and rounded in outline. In other parts where the excavations are not so deep, ordinary multinucleated giant-cells are seen lying in contact with the dentine.

There seems to be still a good deal to be studied in absorption of the temporary teeth—the method of action of these cells being little understood. Whatever substance these cells secrete does not seem to produce any softening action on the tissue much beyond the point of contact—the excavations being clean cut and distinct.

Passing to absorption in adult teeth: as in bone, so in the cementum of healthy teeth, tooth absorption and deposition go hand in hand—many young, and to all appearance healthy, teeth, showing absorption spaces filled with giant cells, and old excavations filled up with newly-deposited material.

The photograph now on the screen is from a bicuspid extracted at fifteen years of age, and a distinct absorption is seen in the cementum, the excavation being filled up with large cells similar to those seen in the absorbing temporary tooth.

The next slide, taken from a longitudinal section of a molar in which a small piece of the bone of the alveolus remained attached to the tooth,

shows the bone on one side and the cementum on the other, the peridental membrane and periosteum filling the interval between them. There appears to have been here considerable excavation of the alveolar bone, and also a large absorption of the cementum, which has been filled up with freshly deposited tissue—the repair being actually in progress in this case—the cementoblasts being crowded together on the newly-formed cementum, as the osteoblasts are on the surface of depositing bone.

Deposits of secondary dentine in the pulp are well exhibited by this method of preparation. The specimen shown was taken from a molar tooth, to all appearance sound, which caused intense neuralgia, rendering it necessary to extract it. The pulp was densely packed with secondary deposits, encroaching in every direction upon the nerves and blood-vessels. This deposit exhibits some curious concentric and radiating masses. The next slide is from a similar pulp, showing some very large deposits.

Another shows a tooth extracted from an old person, in which the whole of the pulp appears to be converted into a semi-calcified material, apparently of cartilaginous consistency, with islands of calcified tubular dentine. I have been struck with the fact pointed out by Mr. Salter in his "Dental Pathology"—that many young and appa-

rently healthy pulps show numerous deposits of secondary dentine. Mr. Salter in the work referred to (p. 139) says: "This change is to a great extent reparative and the result of trivial causes, though I believe it never occurs unless the tooth has been in some way the subject of injury or irritation."

The specimens in which I have seen it were certainly untouched by caries; but they may have been subjected to some form of irritation conveyed to the pulp from the great pressure caused by overcrowding.

Interglobular spaces in dentine are very well stained in the balsam process.

Caries in a fissure in the enamel.—This slide was prepared to show that the process, while keeping the relations of the carious portion to the calcified tissue, retains also in position tissue that has undergone a very considerable amount of disintegration.

The last slide is taken from a rat's incisor, and shows the remarkably strong connective tissue fibres of the pulp.

In conclusion, gentlemen, I have to thank Mr. Swift for so kindly giving his valuable personal attention to the microscope and lantern, and to thank you for your kind attention; expressing the hope that some of the points I have simply touched on to-night may suggest lines of investigation to those engaged in microscopical work.

Weil's Process.

Fresh teeth cut under water with watch-spring saw.
Concentrated corrosive sublimate solution for some hours.
Running water one hour or more.
30 per cent. spirit, twelve hours.
50 per cent. spirit, twelve hours.
70 per cent. spirit, twelve hours.
90 per cent. spirit, + 2 per cent. iodine, twelve hours.
Absolute alcohol till teeth are white.
Running water half an hour.
Stain borax carmine, &c., three to seven days according to stain used.
70 per cent. spirit (+ 1 per cent. h.c.l. if borax carmine) twelve to thirty-six hours.
90 per cent. spirit, fifteen minutes.
Absolute alcohol half-an-hour.
Etherial oil, twelve hours.
Wash this off with xylol.
Chloroform, twenty-four hours.
Thin solution of dried Canada balsam in chloroform.
Thick solution of dried Canada balsam in chloroform.
Water bath at 90° C. till hard.

Discussion.

The President said they were greatly indebted to Mr. Howard Mummery for his very lucid and able paper, and for the beautiful illustrations, and invited comments upon the paper.

Mr. F. Newland-Pedley said he was able to confirm, from his own experience, the value of the process which Mr. Mummery had described, but like many other things it was of some antiquity, being known for the last fifteen years. Some five or six years ago one of his colleagues at Guy's wished to investigate the development of "rider's bone," and it was necessary to show hard and soft structures at the same time. He (Mr. Pedley) cut sections by Mr. Mummery's method, and they were shown at the Pathological Society.

Mr. H. Baldwin wished to ask Mr. Mummery whether the transparent portion which intervened between the dark layers was not chiefly formed of the unstained portion of the odontoblast cell, and whether the dark layer did not consist of the nuclei only of the odontoblast? Also, whether the so-called spaces were not unstained portions of the cells? Again, as to the small agglomerations of cells which were found in the periosteum, and which were said by some to be epithelial pearls, whether there was not some stain which would show whether they were of an epithelial nature or not?

Mr. Arthur Underwood said if it would not be taking a liberty to relieve Mr. Mummery of the trouble, he would take upon himself to answer two of the questions. If the parts were stained with gold the whole cell becomes perfectly stained, and the interspaces are quite marked, and that without confusion of substances; still more the transparent layer with lines between the cells is marked out quite plainly, being in no kind of sense a part of the cell—there could be

no kind of confusion—there was no doubt that an interval does exist. Mr. Underwood thought that they ought really to feel very much indebted to Mr. Mummery for his epoch-making paper in dental microscopy. Though Mr. Pedley seemed to have been so happy as to have hit upon the same process a long time ago, still it had not become public property until that evening. All dental microscopists would feel under a great debt of gratitude to Mr. Mummery for having solved the difficult problem how to cut hard and soft tissues together, leaving them undisturbed by the influences either of the knife or the fluids. Mr. Underwood knew from experience how ready critics were to assert that the appearances were due to decalcifying fluids. He thought a tablet should be raised to Mr. Mummery for having delivered them from these tiresome critics.

Mr. Charles S. Tomes wished in endorsing Mr. Underwood's remarks to emphasise the fact that Mr. Mummery had been the first to produce preparations which would go very far towards necessitating a revision of much that had been said and written on the question of the development of dentine. The points in question Mr. Mummery had hardly touched upon, because until he had thoroughly worked the subject out he very rightly did not wish to say anything he might have to recede from. Mr. Tomes would not have said anything about it had not Mr. Mummery confined himself very much to the exhibition of the process, and had not Mr. Pedley said that the process was not very new, thereby implying that it was not worth while demonstrating what the process could do. This much he would assure Mr. Pedley that Mr. Mummery's preparations were entirely novel to him (Mr. Tomes); they showed things in a manner which he had never seen approached, and he felt sure they would give some results which would necessitate a great deal of re-writing.

Mr. George Cunningham desired to call attention to the fact that the photographs were all the work of Mr. Mummery himself, so that he was not only an able microscopist, but also a photomicrographist who might vie with Mr. Andrew Pringle, who had been described as *facile princeps*.

Mr. Charters White felt that he ought to add his testimony in favour of Mr. Mummery's very able paper. He (Mr. White) had been reading for the last thirty years on the subject of microscopy and photomicrography, and had made the subject a special study, but he was bound to say he had never been so fortunate as to reach the process before. Decalcification of the bony tissues resulted in the destruction of the shape of the cells, and the presence of acid in the pulp makes them very difficult to stain. Mr. White felt that Mr. Mummery had given the death knell to the decalcification of the tissues, and he would for one adopt the process new to him, because he felt it was capable of giving details which decalcification had never yet afforded. He would like to ask Mr. Mummery if the sections could be rubbed down in the manner in which he (Mr. White) had always described for dry sections, because in that way it would be possible to get photographs much clearer and sharper.

Mr. W. Hern wished to ask Mr. Mummery if he could explain how it was that after a process of prolonged and powerful heating, soft tissue—which was known to contain a large per centage of water—seemed to occupy the same space?

Mr. Charters White, if he might be allowed to reply, thought that the use of the corrosive sublimate as a fixing agent, and then afterwards the hardening in absolute alcohol, prevented any further change. The soft tissue being saturated in Canada balsam, Mr. White did not see how it was possible for the real histological elements to alter.

Mr. Howard Mummery, in reply to Mr. Pedley, was not aware that the process had been really well known before, although of course there had been hints of it. To Dr. Weil he thought belonged the credit of bringing it out properly and giving all the minute details necessary for practical working. Mr. Baldwin had already been answered by Mr. Arthur Underwood so ably that Mr. Mummery felt it unnecessary to add anything upon the points which he had raised. He quite agreed with Mr. Underwood that the spaces between the odontoblast layer and the fully calcified

dentine are not part of the cells ; if Mr. Baldwin would look at the specimens under the microscope he would see that. Mr. Mummery wished to thank Mr. Tomes for his kind remarks. He quite agreed with Mr. Charters White as to the evil effects of decalcification, and thought that the specimens might be cut down by Mr. White's method, though as he was only feeling his way he had not yet adopted it. In reply to Mr. Hern, he would say that the spirit takes the place of the water, and the gradual increase in the strength of the spirit prevents shrinking of the tissues. The addition of the balsam solution in graduated strengths drives out the spirit, the balsam taking its place. The slow substitution of one reagent with another—together with the very important fixing of the fresh tissue with sublimate—is the main principle of the process.

Votes of Thanks.

The President did not know that it was necessary to add anything to the applause and hearty recognition which Mr. Mummery's paper had received. It was a great advantage to the Society, the profession, and the rising generation that they had men among them of the ability and the inclination to bring forward the result of their researches in such a manner as had been done that evening.

The meeting closed with the usual votes of thanks.

It was announced that the next meeting of the Society would be held on Monday, 2nd June, when Mr. Leonard Matheson would read a paper on "Some Practical Points involved in the relation of the Upper to the Lower Teeth," and Dr. Silk a short paper entitled "Notes on a series of 1,000 Nitrous Oxide Administrations recorded systematically." Casual Communications by Mr. Sydney Spokes "On a Case of Faulty Enamel"; by Mr. Alfred Smith, "Notes on a Case of Epulis."

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

June 2nd, 1890.

Mr. FELIX WEISS, L.D.S.,

President, in the Chair.

The Minutes of the preceding meeting having been read and confirmed,

Messrs. A. O. Butcher, L.D.S.; J. Greenfield, L.D.S.; C. F. Rilot, M.R.C.S., L.R.C.P., L.D.S., having signed the Obligation Book, were admitted Members of the Society by the President.

Mr. G. W. Bateman, L.D.S., of 93, Ladbroke Grove, London, W., was balloted for and elected a resident Member.

The President mentioned that the Bye-laws had been reprinted, and suggested that Members should possess themselves of copies and read them over.

Mr. Sidney Spokes then read the notes of a case of faulty enamel.

Mrs. L., æt. twenty-five, married, wished to know if anything could be done for her "brown teeth." On examination it was found that a central incisor in both the upper and lower jaws had recently been removed, in connection

with necrosis of the alveolar process. The four first permanent molars were also lost. All the teeth present were of a brown colour, the upper ones being the darkest. Upon further enquiry it was considered that this unsightly condition depended upon a faulty construction and distribution of the enamel, which it was not possible to rectify. The approximal surfaces were affected by caries and, as the patient was anxious that something should be done, the defective teeth in the upper jaw were removed, as far back as the molars, and are to be replaced by artificial teeth on a plate. (The *model* was shown).

In ordinary cases of defective enamel we are accustomed to see transverse grooves across the teeth marking the period at which something occurred to interfere with the due formation of this tissue, but in the present case there are grooves in the long axis of the tooth, showing that the process was modified throughout the whole of the time occupied by calcification. In some places there is a total absence of enamel, and the exposed surface of dentine seems to have been sufficiently hard to survive without the protection of the usual covering. In other places the enamel is laid on in irregular masses. A section made through one of the bicuspids showed the transverse striation of the enamel prisms to be very plainly apparent, and there are spaces or channels to be seen running in the long axis, and these are in places connected by transverse branches, thus mapping out the tissue to some extent into "areas." The family history the patient gave was perhaps the most interesting point in the case. "Most of our family have brown teeth," and the accompanying genealogical tree presents a bird's eye view of her statement.

Both temporary and permanent teeth are brown. They are not so bad when first erupted, but seem to get worse with age. Some of the niece's teeth are much darker, "look almost black." One brother's teeth are worse, the other's better than Mrs. L's. Mr. Spokes concluded his communication by a quotation from Oscar Schmidt, who says, "The more stubbornly a character is transmitted, the greater the number of families, genera, and species over

which a character is extended, the more ancient must it be considered, the earlier did it appear in the ancestral stock."

Table illustrating Mr. Sidney Spokes' Casual Communication on a case of Faulty Enamel.

Mrs. A. Six sons, three daught.

- Mrs. B., B.T.
  - Mrs. D., B.T.
    - Son, B.T.
    - Son, B.T.
    - Son, W.T.
  - Mr. E., W.T.
    - Son, W.T.
  - Mrs. F., B.T., at least two daughters, B.T.
  - Six or seven children.
- Five sons, B.T.
- One son, W.T.
- One daugh., W.T.
- Mrs. C., B.T. ...
  - Mrs. G., B.T.
    - Son, B.T.
    - Daughter, B.T.
    - Son, W.T.
    - Daughter, B.T.
    - Daughter, B.T.
    - Son, B.T.
  - Three sons.
  - Three daughters
  - Mr. H., B.T., no children.
  - Mrs. I., W.T.
    - Two sons, W.T.
    - Five daughters, W.T.
  - Mrs. J., W.T., three sons, W.T.
  - Mr. K., B.T., no children.
  - Mrs. L., B.T., daughter, W.T.

Mrs. C. says that Mrs. A. told her that her (Mrs. A.'s) mother also had "brown teeth."

B.T. stands for brown teeth—W.T. stands for white teeth.

The PRESIDENT asked Mr. Spokes if he had seen any of the teeth to which he had referred.

Mr. SPOKES replied that he had only seen those in the patient's mouth; he had been promised an opportunity of examining the teeth of the mother, but had not yet seen her.

The PRESIDENT desired to know whether Mr. Spokes had had an opportunity of seeing a section of the teeth, and so of judging of the colour of the enamel below the surface.

Mr. SPOKES answered affirmatively, and stated that he had made a section of the teeth, but there was nothing much to account for the colour; it showed that the structure was bad; a good deal of porosity existed, the teeth absorbed something, and they became browner as they grew older. There was no question that the discoloration was

not a surface condition, but was due to some inherent defect in the enamel.

Mr. Walter H. Coffin wished to know if he was correct in inferring from Mr. Spokes' remarks that in no case did brown teeth occur as a reversion through the white.

Mr. Spokes said that was so according to the chart.

Mr. Alfred Smith then read the notes on a case of epulis.

At the request of his friend, Mr. A. T. Scott, he saw the patient, a girl, aged nineteen, in the month of August, 1889. On examining her mouth he found an epulis arising from between the left upper central and lateral incisors, about the size of a filbert, of which she gave the following history:—

In 1887 it commenced to grow, and in August, 1888, it was excised at a hospital in the north of London, and the patient was told to return if the growth recurred. It did recur, and in January, 1889, she presented herself again at the hospital. The surgeon then informed her that in order to remove it permanently it would be necessary to extract the adjoining teeth. Now her dentition being perfect, all the teeth in place, very regular, and not a speck of decay anywhere, she expressed great reluctance to submit to the operation and left the hospital to think the matter over, with the result that it was postponed until she saw Mr. Scott in August, 1889.

At the first consultation Mr. Smith thought of the usual treatment of excision, extraction and cutting away the septum of alveolus; but the girl again objected to the extraction, and then Mr. Smith proposed excision and cutting away the septum with a chisel without extraction, but Mr. Scott suggested burning away the growth and destroying part of the septum at the same time with Paquelin's Thermo-Cautery.

The advantage of this instrument, which Mr. Scott had kindly allowed to be exhibited, is that the point may be kept at a white heat any length of time, by a stream of

benzoline vapour forced into it (Mr. Smith demonstrated the action of the cautery).

Having obtained the consent of the patient the operation was undertaken with the cautery. The neck of the epulis was burnt through, and followed by the point of the cautery until the septum was reached, and this was then well charred. Very little hæmorrhage followed, and less pain was experienced as far as could be judged than that occasioned by the ordinary extraction of a tooth; but a very unpleasant odour of burnt meat pervaded the apartment. This was done on August 24th, 1889. In about a fortnight after the wound was healed. The patient had been seen several times since, and lastly that morning, and there was no sign of recurrence, although nine months had elapsed. Mr. Smith remarked that in all previous cases of epulis that have come under his notice, the growth had been associated with defective teeth or roots, the extraction of which had been indicated, and the cutting away of the septum rendered easy. He said he should be pleased to know if the cautery had been used before in similar cases, and if its use has been attended with success in preventing recurrence.

Mr. J. Dennant (Brighton) exhibited a small contrivance, which was, he said, both very simple and very useful. He called it an iodine dresser. Most practitioners had doubtless experienced the difficulty that patients had in applying iodine to their gums, they generally stain their lips, and practitioners also stained their fingers. This contrivance, which could be made at an extremely small cost, consisted of a stem of black vulcanite with a slot at the top end, into which a little wool is twisted, and perfectly avoided the staining alluded to.

Mr. George Brunton mentioned that the staining could be avoided by using tinctura iodi decolorata, which does not stain the gums. It was made by dissolving a spirituous solution of iodine in liq. ammoniæ, and exposing to strong sunlight.

Mr. C. Robbins stated that he used a still cheaper instrument which answered the purpose; he always instructed his patients to use a common match.

Other members also mentioned having used an ordinary match for many years.

Mr. W. H. Coffin thought that anything of this kind, which the practitioner used himself, was much more convenient if the end were bent at an angle.

Mr. Betts thought that the great advantage of the lucifer match was that it could and would be thrown away when used, and a new one used next time. He did not think that there was the same certainty of the vulcanite stems being thrown away, however cheap.

Mr. George Brunton felt that he owed some apology to the Society for introducing such trifling matters to their notice as the following, but he would run through them as rapidly as possible. First he wished to show some *bleached* rubber dam: it was easily done; soak it in cold water and wrap it up. When dry it is white and will remain so for a considerable time. Secondly, he used a little pad (shown), for applying an astringent to the interior of the mouth, opposite the opening of the duct, and stopping the flow of saliva. He used a strong astringent known as chloralum, which stopped the saliva for a couple of hours, enabling him to work without the rubber dam. He also exhibited a few cutters for running round crowns and trimming roots for pivots. Sometimes he found that in using the syringe one was apt to squirt, and so damage a patient's dress; to avoid this he used a piece of rounded glass with a hole in it, which he placed over the patient's mouth, introducing the syringe through the opening in the glass shield. Mr. Brunton also showed the kind of mouth mirror he used—of an oval form, the shape he personally preferred—into which he was able to fit glasses himself by running a little cement in warm—he used with the mirror an attachment to keep down the mouthpiece of the saliva ejector when working on the lower jaw. He also exhibited

some rouge discs for finishing gold fillings; they were made of a French paper known as "rouge" paper, and when both sides of the discs were required to be used, they could be made by glueing the backs of the paper together with shellac. Lastly, he had three models of cases taken from the mouth, which he would like to present to the Society if they were thought worthy of a place in its museum. One was a model of a syphilitic case showing "Hutchinson's notched" teeth. Another, a remarkable spreading of molars in the upper jaw; the upper were quite outside and overlapped the lower molars. The last case was one of six deciduous incisors in the upper jaw.

The PRESIDENT asked what cement Mr. Brunton used for repairing his mirrors?

Mr. G. BRUNTON: The same as supplied by the depôts for mending teeth.

Mr. WALTER COFFIN wished to know if that cement would stand immersion in hot water.

Mr. W. A. HUNT (Yeovil) said that he had himself found a difficulty with that very cement; it underwent rapid expansion or contraction with heat or cold, and therefore would not do for anyone accustomed to put their mirror in hot water.

Mr. G. BRUNTON remarked that he never put his mirror in hot water; any mirror would be rapidly destroyed in that way, whether that cement or any other had been used. By keeping it in the pocket it was always maintained at the requisite temperature.

Mr. KIRBY (of Bedford) said with reference to the very interesting model showing six deciduous incisors, he would like to ask Mr. Brunton whether he had had an opportunity of seeing his patient later and knowing whether the corresponding teeth in the permanent set were developed.

Mr. G. BRUNTON hoped to see the patient shortly—it was not one of his own patients. If he could take a

model of the permanent set he would certainly supply it to the Society.

The PRESIDENT said the first paper on the agenda was one by Mr. LEONARD MATHESON, but with that nice consideration which he (the President) hoped would always distinguish their profession, Mr. Matheson had waived his claim to precedence in favour of Dr. Silk, who was a visitor, and so with the concurrence of the Society he would therefore call upon Dr. Silk for his paper.

An Analysis of a Series of One Thousand Nitrous Oxide Administrations Recorded Systematically.

By J. Fred. W. Silk, M.D.

Anæsthetist to Guy's Hospital Dental School; to the Royal Free Hospital; and to the Hospital for Epilepsy and Paralysis (Queen Square).

Mr. President and Gentlemen,—In offering to read a paper before this Society upon such a well-worn subject as nitrous oxide, I feel that I am undertaking no light task.

Not only must the dental profession be considered, for obvious reasons, the godfather or guardian, so to speak, of this robust and flourishing child, and naturally, therefore, particularly well informed as to its character, temperament and idiosyncrasies, but this Society includes in its list of Members such names as those of Bailey, Braine, Dudley Buxton, and others, who have already contributed papers on the subject far more able, and of far greater scientific value than anything I can hope to lay before you. I should like, therefore, at the outset, to be permitted to explain exactly the object I have in view in appearing before you to-night. This object is twofold :—

1. In the first place, I wish to insist upon the

importance of keeping systematic records of *all* gas administrations. Whether the individual cases present features of special interest or not, I hold that they should always be recorded, for by this means alone can we hope to explain satisfactorily the many curious anomalies met with in practice.

2. In the second place I wish to give you an example—an imperfect one though it be—of such systematic records. For which purpose I have analysed the first thousand cases that I have myself recorded upon a definite plan; not, I would have you to understand, because I think I have been enabled, by this means, to make any startling discoveries, or to explain any of the curious anomalies referred to, but rather with a view to point out what some of those anomalies are, and to obtain your assistance in the work of explanation.

I.—To thoroughly appreciate, and correctly explain, the action of a drug upon the human body, it is essential to compare the facts obtained by three distinct methods of investigation, viz., the physiological, the pathological and the clinical. Now, as far as nitrous oxide is concerned, the happy absence of *post-mortem* records, though a matter for sincere congratulation, practically eliminates, or at least seriously limits, the pathological element; and although there is pro-

bably still much to be learned as to the physiological action of the gas, we must, I think, be careful to bear in mind the lesson of a recent "Commission," and must hesitate to dogmatise upon the action, or the method of administration of a drug, when our experience is obtained solely in the physiological laboratory, or at best, simply corroborates the experience of one clinical observer.

Physiological investigations, such as those so ably carried out by Dr. Dudley Buxton, and with which you are doubtless all familiar, combined with the clinical observations of many, are the desiderata. Questions of time and opportunity, to say nothing of ability, practically exclude the majority of us from the laboratory, and it becomes all the more necessary, therefore, that we should each of us endeavour to add to the common stock of knowledge in some other way, and this we can do by keeping clinical records of our cases. The necessity and advantages of keeping records has frequently been insisted upon by far abler men than myself, and I need not therefore say anything upon the subject; the question is rather as to the best way of keeping such notes, that is, of the way which will meet with the readiest acceptance at the hands of the profession, and will therefore be likely to furnish us with the largest number

of, and most uniform observations. In deciding this point we must bear in mind the peculiarities of the case, and must recollect—

1. That the patient, as a rule, is a comparative stranger to the anæsthetist, who, for details as to past and family history, must depend upon such information as a third person—often a stranger also—is able and willing to afford.

2. That physical examination and undue cross-questioning are frequently resented, nor do I think that they are often advisable.

3. That the phenomena observed are purely objective; subjective sensations, often of such value in other departments of our art, cannot here be relied on.

4. That the whole duration of the process is so very short, and so much has to be done in the time.

5. That it is but seldom that we can obtain any information as to the after-effects of the administration.

Taking all points into consideration, I myself came to the conclusion, that the end I had in view might be best attained by the use of some tabular arrangement. I therefore drew up the form (see p. 260) which I hand round, and having used it myself for recording nearly 3,000 cases of various sorts, I propose to present you to-night with a sample of the knowledge which such use has furnished.

With regard to this particular form, I think I may say at once, that I have come to the conclusion that it is rather too elaborate for general use; but at the same time I am convinced that, with some slight modifications in the direction of simplification, it is capable of doing good service, though I admit that it is open to the objections which apply equally to all "formal" note taking.

II.—I now come to the second portion of my subject, viz.: the analysis of cases.

In Table I. I have briefly summarised the various points to which I propose to draw your attention, with greater or less detail according to the time at my disposal. My observations have been arranged, as you see, in three main divisions, viz.: antecedent conditions, phenomena, after-effects. The subdivisions represent, as nearly as possible, the headings of the several columns in the form handed round.

TABLE I.

General Summary.

Antecedent Conditions:

- Sex.
- Age.
- Physical State.
- Consecutive Administrations.
- Gas used.
- Time.
- Methods.

Phenomena:

- Respiratory.
- Circulatory.
- Muscular.
- Nervous.
- Digestive.
- Genito-Urinary.

AFTER-EFFECTS:

Immediate.
Remote.

First as to sex and age. For the sake of convenience I have thrown together in Table II. some details upon these matters; the points are, perhaps, interesting rather than important, and I hardly think therefore that I need detain you on these grounds.

TABLE II.

DETAILS OF SEX AND AGE.

	7 years and under.	8–14	15–49	50–60	61–70	?	Totals.	Average Age.
Males	3	25	201	8	3		240	24·18
Females	4	50	681	15	4	6	760	24·32
	7	75	882	23	7	6	1000	

Next as to physical and mental states prior to the administration. In 263 instances notes were made; in the majority, of course, the conditions recorded were trivial, such as nervousness, &c., and could not be said to have any direct bearing upon the course of the administration, in others, however, some such influence appears to have been exerted, for instance:—

I have notes of 21 cases of more or less marked neurotic troubles (other than simple nervousness), to some of which I would refer.

In two of these there was a family history of insanity, and in both the administrations were troublesome, and gave rise to much hysteria during the process of recovery.

Another, an elderly man, had himself been in an asylum. To him I administered on two successive occasions, and on each there were very marked rhythmic movements of the legs as the gas began to take effect. Similar movements were also observed in the cases of two imbecile children, and I shall refer subsequently to the occurrence of this phenomenon in others.

One woman, æt. thirty-three, was suffering from the effects of a former hemiplegic attack, partial loss of power in the limbs of one side being associated with a certain amount of contraction. She, too, developed, on two occasions, the same rhythmic movements in the *affected* arm, and also noticed, as a remote after-effect of the first administration, that the hand, usually so cold, became, as she said, "hot and congested" for the remainder of the day. May not these subjective sensations, if confirmed, afford clinical proof of the dilatation of the blood vessels, which is said to take place during administration?

I have, I find, notes of only three cases of "fits," *i.e.*, of administrations to patients subject to epileptiform seizures; in two of them, however, the record is interesting. One, an otherwise

healthy girl, æt. eighteen, took gas twice at an interval of some days. On the first occasion, beyond a slight tendency to opisthotonos, nothing noteworthy occurred; on the second occasion, however, after the first few inspirations, she attempted to remove the face-piece and speak, but was restrained. She subsequently explained this movement by saying, that she felt a peculiar sensation across her forehead, such as usually preceded her fits. In the second case, a female, æt. twenty-five to thirty, the twitching usually observed at the height of anæsthesia, was of so marked and clonic a character, as to raise a doubt in my own mind as to how far it was simply an exaggeration of the usual phenomenon, and how far due to a "nerve storm."

Of definite and undoubted cases of phthisis, I have only records of four cases, nor can I say that any of them developed symptoms or after-effects at all out of the ordinary.

In actual valvular lesions of the heart, I only administered knowingly in three cases. Two of these do not call for remark; the third, however, is interesting. It was the case of a female æt. sixteen, who had previously had an attack of acute rheumatism, and when I was first asked to anæsthetise her, a very marked mitral bruit was audible over the apex and right round to the angle of the left scapula. To this girl I admin-

istered four times in all, at varying intervals of between seven and fourteen days. On the first occasion it is noted that the lividity, though not over marked, appeared to be more lasting than usual, and this was also the case on the second occasion, when the administration was pushed a little further and there was in fact a distinct tendency to syncope. On the third occasion, the temporal pulse intermitted comparatively early in the course of events, and it was reported that since the first administration the nocturnal cough had become decidedly more marked. On the fourth occasion it was simply noted that she quickly passed under the influence of the gas, and was profoundly anæsthetised. Such a case as this seems to me to point to the conclusion that, although nitrous oxide may be safely administered in cases of valvular cardiac lesion, its re-administration at short intervals is contra-indicated. But here again further clinical study is desirable.

Some of you may recollect a paper written by M. Laffont, and published in Paris some few years back,* in which the author drew a somewhat appalling picture of the evil effects of the gas upon the diabetic, the pregnant, and others. With regard to the first, such evil effects did not

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* *Comptes Rendus Société de Biologie, Paris, Vol. XII. No.* 37.

follow in the solitary diabetic whose case comes within this series, and to whom I administered twice. As to the pregnant, I have administered to nine such in various stages, and in seven of them, at least, I should have been almost the first to have received warning had anything gone wrong. As to the phenomena associated with this condition, I may mention that on two occasions, when the pregnancy was at a very early stage there was a very decided tendency to vomit, both in the very earliest stage of the administration and after recovery, and the same thing occurred in a patient at the fifth or sixth month; and in five out of the nine more or less hysteria is noted. Of the four cases of lactation which I have noted I cannot say much. With one exception I heard no more of the patients; in respect to the one I was told that she was fairly well for the remainder of the day of administration, on the following day had "a bilious attack," and the baby was very poorly. The question of the influence of nitrous oxide upon lactation is one of very great interest and considerable practical importance, and to which, therefore, I hope attention will be directed.

By consecutive administrations, I mean administrations undertaken within a few minutes of previous ones, the patient being allowed to recover completely in the interval. I have sixty-

five records of such administrations. Of these sixty-five more or less decided retching was developed in 12 per cent., going on to actual vomiting in two instances. In two instances, too, the condition of the patient was such as to necessitate pulling forward the tongue with forceps, and in 9 per cent. there was marked hysteria with crying and screaming on recovery. As to the remote effects of the gas in these cases, I have only been able to secure records in nine cases, but of these, in at least six, the records are unfavourable. On the other hand we must recollect in the first place, that in 73 per cent. of these cases there was nothing to call for remark either in the way of immediate or remote effects, and in the second place we must bear in mind that in cases calling for consecutive administrations, the operations performed are usually of a severe and prolonged character, and should therefore bear a part of the blame.

From twenty-eight observations made in administering to 293 cases, I obtained an average of about three gallons of gas used in each case, but I think I may mention that more recent observations have led me to the conclusion that this average is slightly too low, but for serial cases, as in hospital work, I am inclined to think that between four and five gallons should suffice.

As to the time required to induce anæsthesia,

i.e., from the application to the removal of the face-piece, I have made eleven observations, and find it to average 67·5 seconds; but I have had very considerable difficulty at arriving at a fair estimate of the duration of anæsthesia. The variations have appeared to me to be so extraordinary, that I could hardly give them credit; this, I think, is probably due to the rough and uncertain methods employed for determining the existence or absence of the anæsthetic state. The conjunctival reflex is not, to my mind, very reliable either one way or the other, while, on the other hand, exaggerated reflex movements of the limbs are, as we know, not at all uncommon under gas, and by no means indicate a return of consciousness. In this connection I may possibly mention, that in some 400 cases the duration of the anæsthesia has sufficed for the extraction, on the average, of 2·2 teeth per case, but of course that gives us no idea of the actual duration of anæsthesia.

I now come to the methods of administration employed in this series. In the majority of instances, the apparatus used was either the identical one shown, or one of similar but larger pattern. In forty-four cases the gasometer was used. In 467 cases the gas was administered quite pure; for experimental purposes, however, I have, in the course of this particular series,

made use of the supplemental bag, or its substitute, on 502 occasions.

Now much discussion has arisen, and many hard words have been used, in respect to the use of the supplemental bag and the re-breathing of expired gas, and, therefore, the clinical experience derived from systematic records, such as I am bringing before you, cannot but be of service. In Table III. I have endeavoured to summarise the effects of these two methods of administration. You will see at once from this Table that

TABLE III.

METHODS.

	Total Obsvns.	Effects. Immediate.		Remote.		
		Nil.	Bad.	Obsvns.	Nil.	Bad.
Pure	467	81·16 o/c	18·84	28	39·28 o/c	60·72
Supplemental	502	75·9	24·10	33	48·48	51·52

as far as the immediate after-effects are concerned, the preponderance is very decidedly in favour of pure gas; on the other hand the reverse would almost appear to be the case with regard to remote effects, but I am inclined myself to think that this is rather apparent than real, and is due in great measure to the necessarily small number

of cases in which any record can be obtained. I think, however, that I ought to mention here, that I have more than one remark in my note book, to the effect that I was inclined to believe that the use of the supplemental bag tended to accelerate the onset of anæsthesia, and, therefore, that comparatively less gas was inhaled than would be required if given pure.

I now pass to the consideration of the phenomena.

In respect to the respiratory system I shall say but little, wishing to avoid entering the debatable ground as to the specific or the asphyxial action of the gas.

With regard to the circulatory system, I send round some pulse tracings for your inspection. The diagram I show will be recognized by you all as being taken from one of the many excellent tracings made by Dr. Dudley Buxton, by whose kind permission I exhibit it this evening. Dr. Buxton's tracing is, if I may so term it, a model or standard tracing, and, if I understand rightly, was taken under exceptionally favourable circumstances; such a tracing as Dr. Buxton's, we can hardly hope to obtain in ordinary every day experience, but the effect of the administration upon the pulse of any given individual is fairly accurately recorded in the tracings I send round. At the same time, however, you will

observe that there is a strong family resemblance between Dr. Buxton's tracings and my own, *i.e.*, general acceleration of pulse, loss of tidal wave, accentuation of the dicrotic curve, increase in heart force.

With regard to the muscular system, there are two points to which I should like to draw your attention. First, the occurrence of "rhythmic movements" of the limbs, such as swinging the legs, beating time to music with the hands, &c. In the course of this series of cases I have noted such phenomena twenty-seven times; to some of these I have already referred, but I must confess that, with these exceptions, I am quite at a loss, not only as to its explanation, but also as to the class of patients in whom it may be anticipated.

That patients should pass into an opisthotonic condition is, perhaps, quite natural, especially when we consider the exaggerated condition of the spinal reflex movements, but at the same time I am far from sure that such opisthotonos is invariably associated with profound anæsthesia, as it should be if simply physiological. It certainly appears that the phenomenon in question is more frequent in females and in children under fourteen, as might have been expected, but such a fact only renders an explanation of the following case more difficult, viz.:—A man æt. twenty-four, apparently robust and healthy in every

respect. I administered to him on five different occasions at varying intervals, and on each occasion he developed the most violent opisthotonic spasm, sometimes before, sometimes immediately after the face-piece was removed, sometimes early, sometimes late in the course of inhalation. Needless to say that every conceivable "dodge" was tried to prevent the onset of these troublesome spasmodic attacks, but without success. Such cases as this are luckily rare, but when they do occur are very embarrassing.

I now come to what I consider to be the most interesting feature of this analysis, viz., the condition of the pupils. It is pretty generally asserted that during the inhalation of nitrous oxide the pupils dilate widely, and this assertion is made in such a manner as to lead one to suppose that this dilatation is of such constant occurrence as to be almost a sign that the anæsthesia was approaching completion. As to the exact value to be attached to pupil variations, either in nitrous oxide narcosis or during the administration of chloroform, ether, or any other anæsthetic, I am not prepared to say, but I venture to think that such irregularities are nearly as common in the case of nitrous oxide, as they are with the other anæsthetics.

On 797 occasions in this series of cases I have made notes as to the condition of the pupil.

Actual measurements of the pupil are, of course, difficult to obtain in any event, but more particularly during the hurry of nitrous oxide administrations. In sixty-four cases, however, a rough attempt at measurement was made, both before inhalation and at the height of anæsthesia, by means of a slip of ivory, on which were printed in black accurately measured discs, of various sizes, which could be contrasted with the pupils. Of course this plan is, as I say, rough and far from accurate, but still, I think the results so obtained are worth considering. In these sixty-four cases, the average size of the pupil before the administration was commenced was 3·64 mm. At the height of the narcosis the average size was 5·5 mm., *i.e.*, there was an average dilatation of 1·86 mm. Such a degree of dilatation is no doubt quite appreciable if we note the condition of the pupil beforehand, but I doubt very much whether a pupil of 5·5 mm. is what most of us mean when we speak of "a dilated pupil."

Of unmeasured cases I find that I have noted decided dilatation in 366; more or less dilatation in 96; little or no dilatation in 194; dilatation followed by contraction, 20; after dilatation, 15.

You see, therefore, that although the pupil dilates in the majority of cases, the exceptions are sufficiently numerous to attract attention. But, it will probably be asked, are there no cir-

cumstances connected with these individual cases which may or may not account for these variations?

Taking, then, the 194 cases in which the dilatation of the pupil was either quite inappreciable or did not occur at all. In Table IV. I have

TABLE IV.

	Undilated Pupils.	Whole Series.
Total Observations.	194	1000
Males	25·77 o/c	24 o/c
Females	74·22	76
Children	7·2	8·2
Over 50	5·15	2·5
Pure	52·57	46·7
Supplemental	47·42	50·2
Extractions	2·2	2·2

analysed these cases, and at the same time have compared them with the percentages of the whole series of 1,000 cases. It appears from this table, therefore, that non-dilatation is of more frequent occurrence when the gas is used pure, in people over fifty, and in males. You will see, too, that the average number of teeth extracted is the same

exactly as the average for the whole series; *a priori*, therefore, I think it may be safely assumed that the degree of anæsthesia was about the same in both cases, and, I may perhaps add, that twitchings, jactitations, stertor and marked lividity were noted in nearly all—certainly in 90 per cent.

Then again there are twenty cases in which I have noticed a primary dilatation, followed by more or less contraction. This seems certainly much more likely to occur in men than in women, and when the supplemental bag is used. But the total number of cases observed is, I think, hardly sufficient to eliminate possible sources of error, such as air leakage.

As to the after-dilatation of the pupil I shall hope to refer to this later. I think, however, that I have said enough to show you that, as far as my own observations are concerned, they tend to prove that other phenomena, leading us to discontinue the inhalation, may occur prior to pupil dilatation, which cannot therefore be relied upon as a test or sign of the completion of the narcosis.

I have already partly referred to the phenomena associated with the digestive system, while discussing the subject of consecutive administrations, when I endeavoured to point out that in such cases vomiting was particularly likely to

occur. I have noted it under other circumstances, but have hardly time to allude to it again.

I feel, however, that I must say something with regard to micturition and of the development of erotic symptoms. In respect to the former there are exactly ten cases noted in this series, and as it is an accident easy of detection, I think 1 per cent. may be looked upon as a fairly accurate average. Of these ten cases all are females, two are in children under fourteen, the remainder between that age and forty. Although the absolute number of children in which the phenomenon occurred is small, it is relatively large, *i.e.*, 20 per cent., and it must be borne in mind that of the whole 1,000 cases only 8 per cent. are children. In three out of the ten cases opisthotonos was noted, and in a fourth there is a note to the effect that the patient was deeply under, and in a fifth considerable force had to be used in the administration, and there was consequently much shouting and struggling. I may mention, too, that in seven out of the ten cases the gas was given pure. As to erotic movements and sexual phenomena, I can only say that such events have occurred, undoubtedly, in six out of the whole series, and these, with one exception, in young unmarried girls under twenty-four. The exception was in a married woman æt.

thirty to thirty-five, who, as I subsequently ascertained, was in an early stage of pregnancy.

Before leaving the subject of phenomena, there is one point to which I would draw your attention, *i.e.*, the intensification of the stertor, lividity, muscular movements and other signs of profound narcosis, which may momentarily occur immediately *after* the removal of the face-piece. My attention was only directed to this point some little time after I had commenced keeping these records; I am afraid, therefore, that the figures I bring forward will not convey to your minds a very accurate idea of the frequency with which this after-intensification takes place. The total number of cases observed does not, in this series, exceed fifty, of which 30 per cent. are males and 70 per cent. females, *i.e.*, relatively a larger proportion of males. I may, perhaps, be allowed to state, that subsequent observations lead me to incline to the belief, that such after-intensification occurs in a very large proportion, if not in all cases; and I venture to think that it is a point of very considerable practical importance, and one worthy of further study.

Finally, gentlemen, a few words as to what I have termed the remote effects of the gas, *i.e.*, the effects which follow after the patient has left the house or hospital. You will, I am sure,

appreciate the difficulty of obtaining anything like accurate records in this direction, and I have not in this series, made any special attempts to obtain anything like the number of records that would be desirable, in order to determine exactly the remote results of nitrous oxide administration. I merely give the figures for what they are worth ; the majority, as you will observe, have already been discussed under the heads of consecutive administration and methods. Of such remote effects, then, I have seventy-six records. In 42 per cent. of these the record is *nil*, and of the remainder the effects appear to be limited to headache in 15·5 per cent. A curious point which comes out in studying these remote effects of the gas is, that in a very considerable number of instances it has been reported to me, that although the effects of the gas during the remainder of the day of inhalation, have been practically nil, yet, on the day following, more or less unpleasant effects have manifested themselves, such as headache, depression, lassitude, &c. If this point were capable of thorough investigation, I should not be surprised if it were the rule rather than the exception, for I can readily understand that the exhilarating effects of the gas may last for some little time, and may, in turn, be followed by a certain amount of re-action.

In conclusion, gentlemen, allow me to remind you again that I lay no claim to originality, nor do I profess to have made any great discovery. My aim has rather been to insist upon the fact that outside the field of original research, to which but few of us can obtain admittance, there still remains the vast domain of clinical investigation, which all of us are fully qualified to enter, and in which there is still much excellent work to be done; and my analysis of a limited number of cases must be taken as a sample of such work, rather than as a serious attempt to solve any of the difficulties met with in practice.

Form suggested by Dr. Silk for recording Gas cases.

RECORD OF ANÆSTHETICS Administered by From To

No. and Date.	Sex, Age and Place of Administration.	Condition prior to Administration.	Anæsthetic and Quantity.	Method.	Respiratory System during		Circulatory System during			Muscular System during		Nervous System and Special Senses.		Digestive and Genito Urinary Systems.		Operation.	Remarks, After Effects, &c.
					Inhalation.	Anæsthesia.	Inhalation.	Anæsthesia.		Inhalation.	Anæsthesia.	Inhalation and Anæsthesia.	Recovery.	Inhalation and Anæsthesia.	Recovery.		

Discussion.

The President having invited discussion on Dr. Silk's very interesting paper,

Mr. W. A. Hunt (Yeovil) said that in order to save time he would at once take advantage of the President's invitation, and ask Dr. Silk a question. Twenty years ago, he gave up watching for dilatation of the pupils, and the cornea for reflex movements, but he had observed sometimes that a tear would trickle down one side of the face only, showing clearly that the action of the sympathetic nerve of one side alone was affected. Had Dr. Silk noticed any inequality in the size of the pupils?

Mr. Walter H. Coffin wished to ask Dr. Silk on the point of dilatation, whether he was accustomed to give instructions to his patients as to closing the eyes? In many cases the patients close the eye before administration, in others the administrator told them to keep the eye open. He thought some difference in the size of the pupil might be accounted for in that way. He would also like to ask whether Dr. Silk advocated emptying the bladder before administration as a matter of routine.

Mr. L. Matheson, interposing, desired to say that if any members were shrinking from discussing Dr. Silk's paper out of consideration for him, he should be quite willing to defer his paper to another meeting.

The President thanked Mr. Matheson, and said that it would certainly seem desirable with so good a meeting, which included several eminent anæsthetists, that they should fully discuss Dr. Silk's valuable paper.

Mr. George Brunton thought that the opportunity of discussing the paper should not be lost, and wished to say that some of the principal points had not yet been touched upon, one of them, viz., the pulse tracings, he should

personally like to know more about, as many of their men were not in the habit of taking them at all.

Mr. Woodhouse Braine did not know whether they ought to have anything to say about ether. There was one little point: during the last twenty years in which he had given it, he had had five or six cases in which the patients—boys chiefly, under the age of sixteen—on the following day were very drowsy and suffered from delusions, one person refused to take food, alleging that poison had been put into it. It was quite certain that the result of ether was in some although rare cases to produce delusions; and it had been pointed out by one of the physicians to St. Luke's Hospital that this condition had degenerated into idiocy. With reference to epilepsy in the administration of gas, Mr. Braine was quite sure it might be given with perfect safety to epileptic patients, and he knew of cases where gas had been administered while patients were actually under an epileptic seizure. He was called in to give gas to an epileptic in Bloomsbury Square, and when he arrived the boy was in an epileptic fit; Mr. Braine administered the gas notwithstanding, and when the boy recovered he did not have any of the after effects of long sleep to which he had previously been subject. In these patients he had always noticed that they came under the effects of an anæsthetic very quickly. Referring to deepening of anæsthesia after the removal of the face-piece, he said he thought it was generally in cases of extraction of lower teeth that this occurred, and his explanation was that it was due to the tongue being forced back while being put out of the way for the convenience of the dentist. Mr. Braine very rarely gave gas in private a second time because the patients did not recover so well —it was quite a case of fees against comfort. With reference to rhythmic movements, he thought they very often began in a voluntary movement on the part of the patient to show that they were not insensible, because he had asked patients afterwards and they had replied, "Well, I thought if I did so, you would know I was not insensible." He thought it a bad plan to allow them, because

when commenced they often got exaggerated in the end, and the patient's hands would get in the way.

Mr. G. H. Bailey thought that the Society should give Dr. Silk a hearty vote of thanks for his paper and for having given them the tabulated records of cases. He thought there was no doubt that those who were in extensive practice would find some difficulty in the way of keeping a tabulated record; in private practice there would be diffidence on the part of patients in answering some questions. The question of sex would not present any difficulty, but age was a delicate matter about which to ask a lady. But in hospitals it could be done, and tabulated records should be kept. With regard to epilepsy, he quite agreed with Mr. Braine. In reference to after intensification of effects, Mr. Bailey said in taking out lower molars the patient would sometimes get semi-asphyxiated, and the operator would become alarmed, but if the tongue were got out of the way the patient recovered. Mr. Bailey had never advocated pulling the tongue forward, and he had never seen the necessity for it if the gag is taken out of the mouth and the chin put up. With reference to pupil dilatation, his opinion was that in profound anæsthesia it is always dilated. He was perfectly sure that in all his own cases the pupil was dilated. In one case of extreme dilatation the patient, a man, was delighted that he felt so comfortable after the administration, showing that the dilatation had no ill effect. There was a little difficulty when Dr. Silk talked about taking the face-piece off. Jactitation, which is the only known reliable symptom of complete anæsthesia, one got in five or six seconds. The mouth-piece is taken off, and he would say absolute anæsthesia continued for about twenty seconds; that seemed a short time, but a great deal could be done in it, one could extract a tooth in three seconds. Dr. Silk stated that he gave pure gas; Mr. Bailey was rather astonished at the quantity. Whether he (Mr. Bailey) was extravagant or not he did not know, but he usually marked off his 100 gallon bottles for fourteen inhalations, that would be about seven gallons for each patient. However, the best way to get at the actual quan-

tity used would be to ask the house surgeon of the hospital, and this he would do. He thought even four gallons a small quantity: perhaps he did not give the gas in the way that Dr. Silk did. He (Mr. Bailey) gave it using a face-piece with an expiratory valve only, no inspiratory. He did not see his patients get blue. His Cattlin's bag was very small, only one-and-a-half gallons. Children were most liable to opisthotonos, women next, and men least. He (Mr. Bailey) could only remember a few cases of men having opisthotonos. One patient he had who fought a long time after the tooth was out—about half a minute; he was a very intellectual man, his fear was that he should go off again. Mr. Bailey was perfectly sure that gas might be given in almost any condition of heart disease. He had chiefly risen for the purpose of thanking Dr. Silk for his very interesting paper.

Dr. Dudley Buxton said that at that late hour of the evening it would be wholly impossible to attempt an adequate criticism upon Dr. Silk's paper. There were, however, some points upon which he would like to touch, in reference to the question of the advisability of administering nitrous oxide gas to epileptics and persons of unsound mind. Dr. Dudley Buxton proposed to offer the result of his experience, which had been pretty wide. It had been pointed out by Dr. Savage, of Bethlem Hospital, and by others, that attacks of acute mania had apparently been determined in those predisposed by the administration of laughing gas, chloroform and ether. It was a mistake, he thought, to suppose that true delusions followed such anæsthetics unless in the predisposed, and further, even in persons who had a bad family history, or had themselves been mentally affected he believed from his experience that such recurrence of attacks was very rare. In instances in which he had given gas to lunatics, for extractions and for surgical operations, he had had no particular difficulties, and certainly none but what a little tact could overcome, and he had not met with exacerbation of the patient's condition as a result of the gas. Indeed, they had seemed cowed and more tractable after the administration of the anæs-

thetic. Epileptics and persons the subject of epileptiform convulsions, took laughing gas very well. Dr. Dudley Buxton did not think that taking that anæsthetic in any way increased the chance of their having a fit, but if a fit did come on he did not consider it any indication for discontinuing the anæsthetic. In a tolerably long series of brain cases with which he had assisted his friend and colleague, Mr. Victor Horsley, he had had to deal with many in whom slight causes originated epileptiform seizures, and in only one case had a fit occurred whilst gas was being given. Upon this occasion he went on with administration, and the patient became unconscious, while no complications occurred. Dr. Dudley Buxton asked whether Dr. Silk's cases were taken from records of hospital patients or of private patients, and he made the enquiry because he felt the statistics given must be allowed for in a different way, according as one or the other class was dealt with. Hospital patients were herded together in out-patients' waiting rooms and were, from reasons into which he need not enter, always very highly nervous and excitable, and not at all favourably placed for taking gas. It was a common remark for them to make as soon as they resumed consciousness, "Did I scream?" They went to sleep with the idea that they would scream, and as a result they awakened doing it. He thought to get the full value of the records of cases, that they should be divided into different classes, according as they were private or hospital patients. He did not quite agree with Mr. Bailey when he said it was impossible in private practice to elicit the required particulars. As a rule, the dentist knew the patient's family, and his (Dr. Buxton's) experience was, they were always most ready to help forward any investigation. He was quite sure that Mr. Bailey, with that suave manner which forms so conspicuous a trait of his bearing, could obtain particulars of his cases, and would by so doing, confer a benefit upon the profession. Turning to the question of heart disease, he would emphasize most strongly what Mr. Bailey had said. He was quite sure that valvular disease of the heart was *per se* no reason

for refusing to administer gas, but rather a strong reason for giving it. The only cases that had in his hands given rise to unpleasant symptoms, were those of the functionally feeble heart, and the heart weakened by degeneracy of its muscular coats. He had no hesitation in saying that even in these cases the effects of the shock was far more likely to be detrimental to the well-being of the heart than could be those of nitrous oxide gas when properly given. There were many other points upon which he would have liked to have touched, were he not warned by the procession of time that all things must come to an end.

Dr. Silk felt that he had to thank the Society very heartily and sincerely for the very kind manner in which they had received his remarks. He had no idea that he would be displacing anyone, or leading to a transfer of business to another evening. He was very sorry that Mr. Matheson's paper should have been postponed, at the same time he was very much indebted to him for having allowed his paper to take precedence. There had been so many speakers who had raised questions of the greatest importance that he could not hope to answer all of them at that late hour. Mr. Braine had raised the question of ether, and he (Dr. Silk) hoped Mr. Braine would not think he was being treated cavalierly if he said with Mr. Bailey that he regarded it as rather outside the scope of the paper. With regard to epilepsy he did not know of any reason why gas should not be given in such cases. With reference to rhythmic movements, the rhythmic movements as he meant them, were distinctly not those which commence with the patient drawing attention to his condition; they were not the movements of lifting the warning finger, they were the movement of the knee. Mr. Bailey had said something about the after intensification of the stertor. Dr. Silk was glad that Mr. Bailey agreed with him that there was an after intensification for about twenty seconds, that might account for the fact of the pupil being dilated; but what he wished to point out was that before the dilatation you get jactitation and so on. Some question had been raised by Mr. Bailey as to the quantity of gas, Dr. Silk

did not regard the point as of much importance, but one could very readily see that with no inspiratory valve Mr. Bailey's average and Dr. Silk's were easily accounted for; he did not think there was any great discrepancy. Dr. Dudley Buxton had asked if the recorded cases were those of hospital or private patients; he (Dr. Silk) did not quite agree with him as to the difference between one class of patient and the other; it was rather a difference of degree than of kind, which education alone would account for. In reply to Mr. Hunt's question, Dr. Silk said he had not remarked any inequality of the pupils. With regard to opening or shutting the eye before administration, as suggested by Mr. Coffin, he generally found that the patient was placed in the full glare of the window, and he did not know that any difference would be made in shutting the eye. His average was taken from a large number of cases, and any slight difference there might be would reduce itself. He should think that in the majority of cases the eye was open. With reference to urinating, he thought all administrators would endeavour to get the bladder empty, but it was not always possible; it was a good routine practice.

Votes of Thanks.

The usual votes of thanks having been passed, the President announced that the next meeting of the Society would take place on November 3rd, when the adjourned paper by Mr. Leonard Matheson, would be read "On some Practical Points in the Relation of the Upper to the Lower Teeth;" also a paper by Mr. Storer Bennett, "A Description of some Interesting Specimens of Comparative Pathology at present in the Museum."

The meeting then adjourned.

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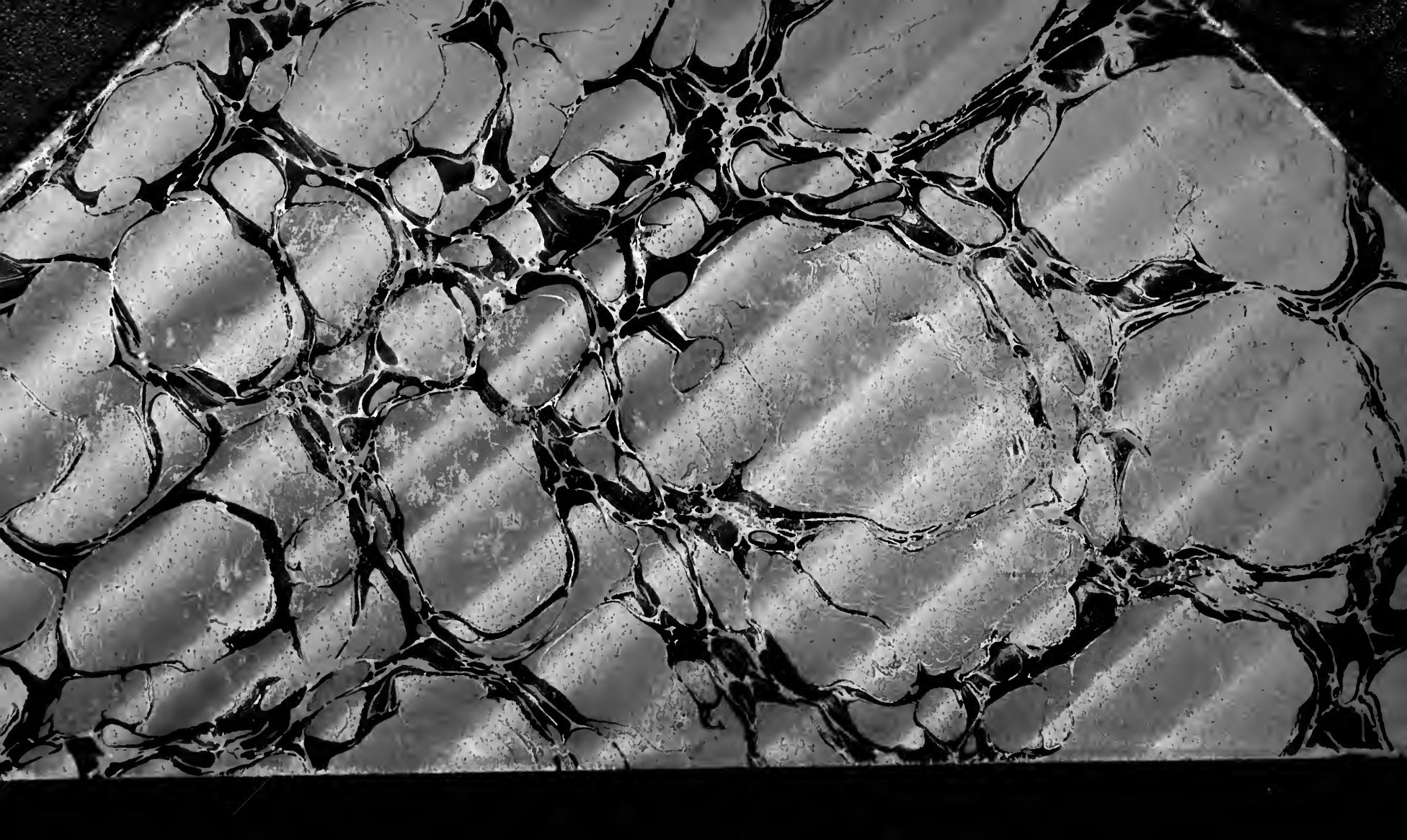
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